July 1954

Editorial

QUITE regularly we hear from some readers who are surprised to find that we build and test every piece of equipment described in the pages of Radio and Hobbies.

We would have thought that the photographs which appear with the articles would have left no doubt on this point. After all, ready-built chassis don't exactly float down from the clouds, although there are times when we wish they did!

From the very first issue of Radio and Hobbies we realised that if our readers are to have any confidence in our designs, we must first prove to ourselves that each idea is sound, that the finished design works as it should, and that all the parts can reasonably be obtained for others to duplicate our work.

This requires a technical staff able to originate all kinds of projects, to build them up on the bench, and to write about them afterward. There is no other way to be sure. As it is, we know that if the job is tackled the way we did it, and according to the details we have supplied, any reader with average intelligence will be successful.

There are many hours of work the reader does not see behind some quite simple designs to maintain this ideal. Every one of our staff knows what it is to burn midnight oil searching for a better way, or chasing some query which must be answered before we go to press. But that is all part of the game.

And so as each month comes around, there are discussions and conferences as to what shall appear in the issue, which jobs are just about ready for release, and which don't look so good. Not often do we have projects that don't work, but it does happen. Nothing is scheduled for appearance in the issue until in its final air test it lives up to the standard we originally set down for it.

There is reward in all this work, and that is what keeps our interest keen. We learn from the stream of letters how many readers have obtained pleasure and instruction from our articles. During the war we knew only too well how many who played their part owed their start in radio to our magazine.

You can be certain, therefore, if you tackle one of our designs, that we made up the original, otherwise you would not have read about it. And if you don't wire it with Tarzan's grip, as did one reader, or mount output terminals on a strip of aluminium, as did another you should make it work as well as we did.

John Moyle

INDEX

	Page
Magical Check for Motorists	3
Report On TV	4
Wide Screen Looks The Winner	7
Friction is a Useful Friend	11
A Fortune in Seaweed	14
Technical Review	19
News and Views	25
A Simple Set For Beginners	28
The Serviceman Who Tells	37
Amplifier for Crystal Pick-ups	43
A Course in Television	51
Here's Your Answer, Tom	54
The Mantel Minor	56
Some Truths About Aerials	66
Making Your Equipment Safe	67
Let's Buy an Argument	70
A Reader Built It	80
Trade Reviews And Releases	81
Report on the HGP-40 Pick-up	84
Dial Mounting on the Fireside Five	89
Off the Record	92
Record News From Abroad	95
Some Thoughts on Enclosures	97
Short Wave Notes	98
Ham Notes with Bill Moore	99
Making an Electric Bedwarmer	104
Answers to Correspondents	110
Radio Crossword	111

RADIO AND HOBBIES IN AUSTRALIA

A NATIONAL MAGAZINE OF RADIO, HOBBIES AND POPULAR SCIENCE

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Vol. 16 No. 4

SUBSCRIPTION RATES
C'wealth, NZ, N. Guinea, Fiji—18/- pa
United Kingdom—£1/-/6 pa
B. Empire—£1/3/- pa
Foreign—£1/5/- pa

Published on the first Friday of each month by Associated Newspapers Ltd., 60-70 Elizabeth St., Sydney.

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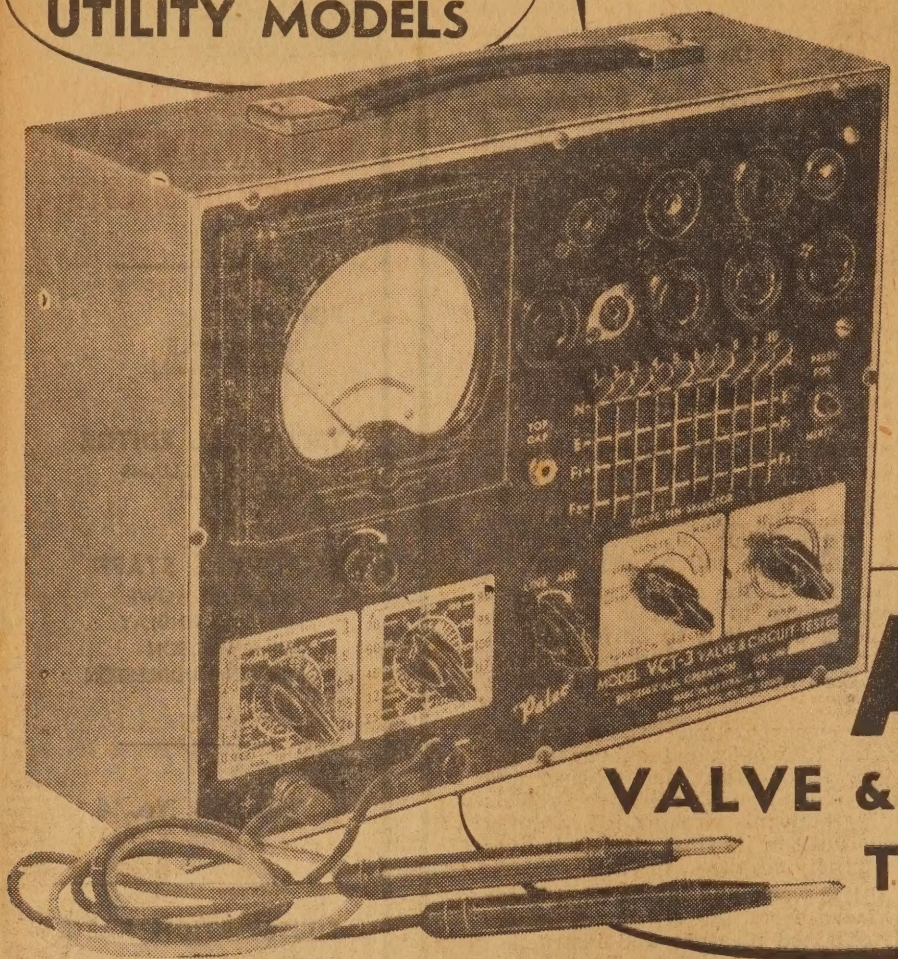

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A MAGICAL CHECK ON MOTORISTS

THE pay-as-you-ride highway is moving into the era of the automatic coin device in USA. The first installation on New Hampshire's Hampton River toll bridge, promises a minor roadway revolution. The deposit of either two nickels or a dime in the slot changes a sign from "Stop" to "Go". As each car passes, a magnetic device hidden in the pavement registers the metal body and switches the sign to "Stop" again. No barriers are used. It is estimated that a six-lane installation will need only nine operators instead of the present 20. If you don't pay a horn blows, summoning a State trooper and a camera clicks, recording the licence plate of the offender.

Report on Television

Publication of the report from the Royal Commission on Television has brought TV an appreciable step nearer to Australia. There is no obligation on the Government to accept the report, although its terms are such that most recommendations appear logical and inevitable. After considering them, the Government will make decisions and bring down legislation which will be the real basis on which the TV system will come into being. The report is too long to reproduce in full, but this summary covers the main points likely to be of immediate interest.

THE Commission was set up by letters patent dated February 12, 1953, to inquire into the number of TV stations which can be established and maintained, bearing in mind the economic conditions of the country, the areas to be served, program standards, periods of operation and other matters of a like nature affecting TV in general.

To this end, evidence was heard in public from men and women prominent in the community as engineers, businessmen, social workers, religious workers and so on to the number of 164. In addition a large number of documents listed in an Appendix were studied concerning the impact of TV overseas.

The preparation of the 250-page report and its publication took a much greater time than was anticipated or hoped for, but it is doubtful whether any time was, in fact, lost. The Royal visit and the Federal election would in any case have prevented very much action during the past six months, and there is nothing in the report which anticipates revolutionary or unexpected courses.

NO DELAY

The basic recommendation of the Commission undoubtedly is that TV should be introduced without delay. In reaching this conclusion, it heard a large amount of evidence so that a complete picture could be obtained of TV's possible impact on our social, industrial and financial structure.

It also consulted overseas experience in an attempt to estimate how trends observable elsewhere are likely to show themselves here.

The fears expressed by some that TV would be a bad influence on the nation's social life obviously did not convince the Commission, which could find in them nothing more reprehensible than is frequently seen in something new and influential.

It felt that because TV or any other such medium could be misused is not in itself an argument for not using it. Later recommendations made it clear that many precautions will be necessary to avoid possible pitfalls, but that these can be provided without very much difficulty.

The point was made, incidentally, that the Commission's ideas referred only to the period of TV establishment, and were not to be taken as a blueprint for long-term use.

ECONOMIC IMPACT

The Commission found no reason to believe that TV would place any serious or even significant demands on the nation's economy. In this it consulted the Division of Industrial Development, the Department of National Development, the governor of the Commonwealth Bank, the secretary to the Treasury and leading economists.

by The Editor

All testified in similar vein, and their ideas supported the view that industry stood to gain much from opening up this new field.

The second important recommendation is that both national and commercial stations should be set up. This has been a bone of contention for a long time, and a prime source of disagreement between political parties. It is difficult to see how the claims for a commercial service could reasonably be withstood for any time, and this is another recommendation which is unlikely to be upset when the report is being considered by Cabinet.

Most people expected, too, the suggestion that a limit should be placed on the number of stations. This was done not only because of program difficulties, but also because the number of available TV frequencies is limited. It relates also to the number of stations which initially can be expected to give an adequate service coverage. It rejects the idea that there should be a "free-for-all" in a race to get started.

The suggestion is that the start should be gradual. A national station should be set up in Sydney, followed by another in Melbourne, and thereafter in the other capital cities and areas of high-population density as finance allows.

COMMERCIAL TV

Commercial licences should be granted to two stations in Sydney and in Melbourne, with others to follow as soon as possible in other parts of the country.

The idea that TV stations should be publicly owned, and time-leased out to a number of operators was not favored. It was felt that those responsible for the programs should also control their own technical and administrative services.

The licensing structure, therefore, seems likely to be similar to that

ow operating in the broadcasting ield except that limitations on the umber of stations will be more evere.

The national TV service, in the Commission's opinion, should be included as part of the responsibilities f the Australian Broadcasting Commission, but only on the understanding that it will not prejudice the fficiency of the national broadcasting system.

These responsibilities should also nclude technical services, which in he case of broadcasting, are in the ands of the PMG.

If accepted, this recommendation vill enormously increase the commitments of the ABC and will renler it an extremely powerful and nfluential body.

It will also mean great increases n its expenditure and general radio nd program resources, for to some legree these must overlap.

It may even mean that eventually he ABC will take over the provision of all its technical services.

ICENCE GRANTS

In the report, there is no indication that TV licences should be granted to holders of commercial broadcasting licences rather than to anyone else. On the contrary, there is mention, as suggested in our leader last month, that commercial stations might be wise to consider application on a co-operative basis, remembering that the number of commercial channels in each city is likely to be limited.

It is recommended that commerial licences should be granted by he minister—the Postmaster-Geneal—as the issuing authority, who vill be advised by the Broadcasting Control Board, which is named as suitable Statutory Authority to xamine the conditions of licensing nd make recommendations to the inister. Licences would be granted fter a public hearing during which vidence would be necessary that the pplicants could, in fact, erect and perate a TV station and provide atisfactory programs.

The board considered, too, that in ny Acts concerning TV, provision hould be made to avoid undesirble concentration of ownership, uch as are now provided in the Broadcasting Act, and that matters uch as the transfer of licences hould be similar to those already n this Act.

TATION SITING

The Commission did not overlook he matter of station siting, and ecommended that in any given area, V stations should be located all t the same point.

The reason for this may not be mmediately obvious, but it is imortant. To obtain the strongest ignals, particularly at some distance rom the transmitters, it is common ractice to use directional aerials vhich receive strong signals from he direction in which they are imed, but virtually nothing from lsewhere.

To make these aerials rotatable, s would be necessary if the stations vere dispersed, would be costly and nconvenient. But if all stations ransmitted from the same point, the erials can be fixed.

Moreover, good TV sites don't always grow on trees, and it is likely hat each area will be able to find one outstandingly good position. By far the most important consideration is height above the surrounding terrain, and a clear optical path in all directions. The technique of erecting a very high mast at a suitable spot, and mounting several aerials upon it, is likely to be used here, and has been proved overseas.

With these things in mind, we might say in passing that an ideal spot for Sydney and its environs might not be in the city and suburban area at all, but on a high peak in the Blue Mountains, such as Kurrajong.

A powerful station there could not only flood Sydney with a big signal, but extend a considerable distance along the coastal area in both directions.

If it is essential to extend the coverage of stations to the limit, such siting could prove extremely valuable, the programs being linked to the remote transmitters by microwave links.

However, it might be found in allotting frequencies, and considering possible overlap of service areas, that new problems would arise if this were done, and decisions of this nature must be reserved until a full national coverage plan is undertaken. It is a subject in itself, and a highly important one.

FREQUENCIES

Great care was taken by the Commission when considering the allocation of frequencies for TV. A number of frequency bands are available ranging from 44 Mc down to 960 Mc per second.

Having decided that the type of picture likely to be used would demand a bandwidth of about 7 Mc for each channel, the problem was to find which band will give the best coverage and at the same time accommodate the largest number of stations without calling for complicated receivers.

Between 44 Mc and 216 Mc there would be room for seven TV stations, omitting the band from 90-108 Mc at present allocated for possible FM broadcasting.

This would be enough for three channels in capital cities and two in Newcastle, plus one channel at least for every town in the Commonwealth with a population over 5000.

These frequencies, known as the VHF, provide a better service than those between 470 and 960 Mc, known as UHF, where there would be 47 channels available.

VHF FAVORED

The Commission did not favor the use of UHF bands because at the moment it is difficult to design efficient equipment at so high a frequency, and because the VHF appeared to offer full frequency facilities for some time at least.

On this point the Commission's recommendations appear to be wise, but if it were possible to narrow the necessary tuning range of receivers to say 174-216 Mc, the task of receiver manufacturers would be made very much easier.

Extension up to 44 Mc would give two more channels, but might well call for band switching measures unless stations in the same area could be given frequencies of the same order.

In the frequency groups available for use, there is the 90-108 Mc band set down for FM, and it was suggested that this band could also be given over to TV.

Such a course might be most ill-advised, for it would block permanently any possible move from the broadcast band which is now overloaded.

As the Government has already said it would grant licences in the FM band if requested, it is unlikely that TV would be allowed to encroach into the FM domain. At the same time, a rearrangement of allocations for TV and FM might effect a changeover in functions of some of the bands to allow the largest possible number of stations to be used without calling for too large a tuning range of TV receivers. There is everything to be gained from grouping them so that all the channels in use present an unbroken run from the highest to the lowest. This would greatly simplify the problem of receiver design, and, of course, keep costs and maintenance difficulties to a minimum.

It is a process which the Commission has included in its list of recommendations.

PROGRAMS

The Commission was faced with a big task when considering the problems of TV programs. It is obvious that they have favored some plan which will call for close coordination between all services, national and commercial, in the common aim of making the most of our program resources.

In endeavoring to provide a basic guide, it has recommended that "the objective of all TV stations from the outset must be to provide programs that will have the effect of raising the public taste".

Whether this statement will be capable of satisfactory interpretation into fact might be open to doubt, as some of its terms will themselves invite violent disagreement.

However, if we can generally class programs as good or bad, rubbish or good stuff, then we can assume that the Commission has warned against the rubbish. It is obviously concerned about it, for it has said that self-regulation in the matter of commercial programs is not considered sufficient to preserve their quality.

It apparently assumes that, in the case of the national stations, there will be less difficulty by the very presence of unified control, as against a large number of companies competing in the highly competitive field of commercial TV.

One of the considerations it suggests should carry much weight in considering applications for a licence, is the ability of the applicant to command resources sufficient to guarantee that program levels will be maintained.

USE OF FILMS

We are justified in assuming that the Commission wouldn't regard endless use of films as being satisfactory program quality, although it is pointed out that their use in the initial stages would not be objected to until the necessary organisation had been built up.

The Commission did not imply that the commercial stations would necessarily be lax in program standard. Although suggesting a num-

(Continued on Page 37)

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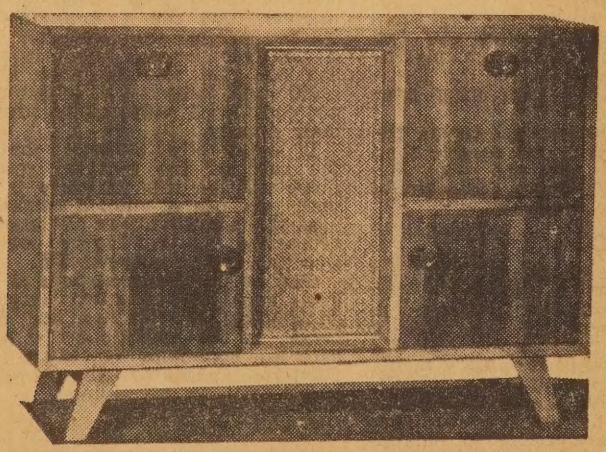

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WIDE SCREEN LOOKS THE WINNER

TO put it another way: Can this development be achieved on present standards, or does it involve completely new equipment, particularly in the theatres?

If it does, then a lot of people are going to take a lot of convincing!

The attitude of the movie industry is based on precisely the same "deadlock" factors that operated a little while back in the color v. black-and-white television fight.

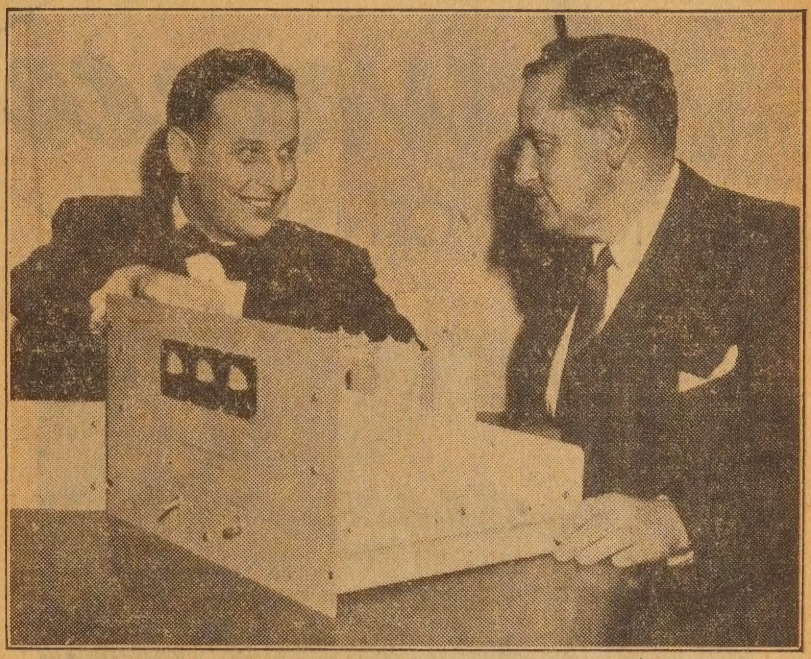
(1) It is hard to get backing for any new system unless there is an assured audience to pay for it. (2) There can't be an assured audience until plenty of "user" equipment is available. (3) No one will sink money into "user" equipment until the success of the system is assured.

It becomes a kind of hen-or-the-egg puzzle in reverse. Which has to come first?

COMPATIBILITY

The television industry solved its immediate problem by taking the attitude that new color programs had to be compatible — that is, tuneable, on existing black-and-white receivers. There was, therefore, an assured audience from the outset, just as there can be for new film ideas which are adaptable to present equipment.

In its efforts to recapture dwindling audiences, particularly in the US, the movie industry has declared an "open season" for would-be inventors, both inside and outside its own laboratories.



MGM head technician in Australia, Robert Lucas (right) discusses the 3-channel integrator unit with C. Robert Fine, President of Perspecta Sound Inc. and inventor of the system. Perspecta Sound has been adopted, according to latest reports, by MGM, Paramount and Warner Bros.

From being a word almost peculiar to the television industry, "compatibility" is being bandied about very freely today in the movie world. The ultimate fate of many a recent development, like 3D, wide screen and stereo sound, is likely to depend less on mere merit than on the answer to the bogy question "is it compatible?"

This device, invented by an Italian, Professor Basso Ricci, can distribute the vapors from fifty different liquids, electronically mixed. With such a gadget, we may some day have "smellies". Problem—how to remove one smell before we are given the next!

All kinds of schemes have been suggested and tried out, but it is becoming increasingly obvious that the ones most likely to succeed are those which are fundamentally compatible. In other words, schemes which produce certain advantages with special equipment, but which do not prevent the film being shown through ordinary projectors.

In large centres the advantage can be exploited — whatever it happens to be — with full Hollywood ballyhoo. After the initial runs, when the tumult and shouting have died, the same film can continue to earn money by being shown in the ordinary way.

The recent history of 3D provides an excellent example of this. When the subject was resurrected two or three years back, there were all kinds of arguments as to the best method of recording the two images. Suggestions were made about wider films and the use of smaller images placed side by side on a single film.

TWO CAMERAS USED

Hollywood finally settled for the simple expedient of taking two separate films with interlocked cameras.

To exhibit them, it was then only necessary to interlock two standard projectors and provide for larger spools to avoid frequent breaks in the program.

A few theatres did show 3D films, but for one reason and another, pub-

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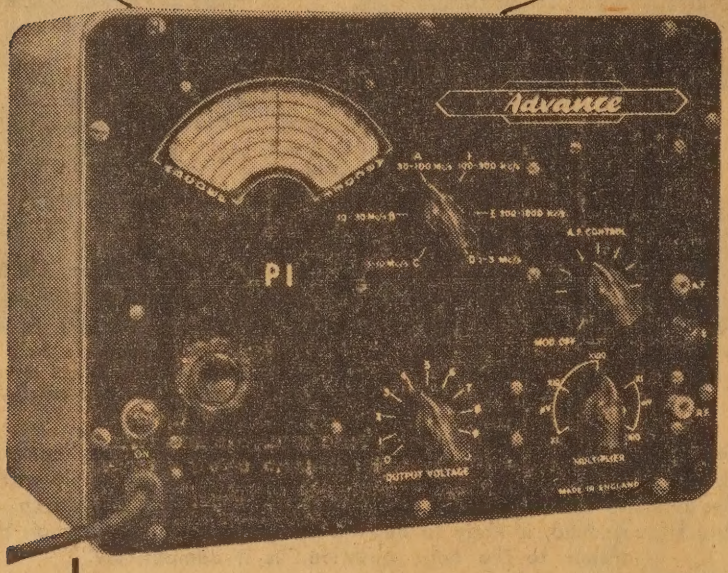

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Up-to-the-minute design of the oscillatory circuit and special attention to screening and filtering ensure that even at 100Mc/s stray field is less than 3 microvolts.

The P1 employs an accurate attenuator system which embodies a non-inductive slide-wire followed by a five-position 75-ohm ladder network. The 75-ohm cable, correctly terminated by the 'Advance' TP8 pad, obviates reflections due to mis-match and ensures that the output voltage at the dummy aerial is substantially that indicated by the attenuators.

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A scene from The Robe showing the panorama of the market place. The wide screen appears to have "gone over" where 3-D missed out, at least for the time being.

lic reaction to them was very disappointing.

Hollywood's policy of compatibility paid off, however, because the individual prints of these and later 3D pictures were made available for normal projection.

Nobody had to lose much money or sleep over the public's lack of enthusiasm.

It would have been a very different story had the movie world tried to sponsor a new type of film, requiring special projectors in every theatre aspiring to show it.

Quite apart from the cost of such projectors, most theatres would have been faced with the need to rebuild and enlarge their projection booths to house them.

For the time being (and once again) 3D has taken a back-seat, although the problem of "3D without glasses" remains as an alluring and intriguing goal.

The same scene as above taken with the normal camera shows that only about half the picture can be shown.

CINERAMA

From 3D, Hollywood has turned its attentions to wide-screen presentation. In this line, Cinerama was to be a world-beater. Literally hundreds of papers and magazines carried an explanation of how it would work.

It was envisaged that three synchronised projectors, screening separate films, would wrap a picture around the entire front of the theatre.

While there could be no doubt that the result would be spectacular, managers boggled at the thought of rebuilding their theatre fronts and installing triple projection booths.

They certainly wouldn't do it for the sake of a few special pictures. And, obviously, its backers couldn't produce Cinerama epics for a few special theatres! It wasn't in any sense compatible, and it flopped as a result.

CINEMASCOPE

But the idea of a wider screen had sales appeal, and the theatres themselves showed the way by the simple expedient of using a wide-angle projection lens and blowing up ordinary pictures to an abnormal size. A simple mask was added to trim the top and bottom and achieve the much-publicised "panoramic screen" effect.

The public liked the change, and it didn't need to happen to every theatre overnight. It still hasn't happened to every theatre, but it probably will, in due course.

It is little wonder, in the face of this reaction, that the film companies queued up for the use of the anamorphic lens and the CinemaScope idea.

It allows them to photograph true wide-angle scenes and compress them on to a standard film frame. Placed in front of the projector, the same kind of lens expands the distorted photographic image back to its original aspect ratio.

NEGATIVE GRAIN

The important thing about the system, from the industry viewpoint, is that it is completely compatible. The projector is standard and can be used interchangeably for an older type film by the simple expedient of swinging the special lens out of the light beam.

This kind of compatibility has been achieved only at a price, however. The degree of enlargement from a tiny frame to a whole theatre front is such that film grain has become a major problem. It has to be beaten before the public begins to comment that "these wide-angle pictures aren't too clear".

Investigation has shown that most of the trouble occurs in the negative, where fineness of grain has to be sacrificed in the interest of photographic speed. The positive prints can be made under more favorable conditions.

At least two of the major companies are reported to be experimenting with a modified camera in which the film runs horizontally instead of vertically.

It is thus possible to photograph a wide-angle picture directly on to a much larger effective negative area.

It is later printed, using the anamorphic lens, on to standard positive stock, being reduced and placed across the film in the process. The negative grain structure is reduced with the picture in the same proportion.

The use of a wider negative in the cameras would obviously achieve the same result.

Whatever the final solution, the target is to achieve a degree of picture definition no poorer than the public has been accustomed to in the past. If some overseas prints are any criterion, it would not need to be!

The problems of CinemaScope do not stop here, of course. It is all too easy to fill the screen with grotesque close-ups or to have the wide-angle lens reveal more than is intended. Crowd and battle scenes can look very unconvincing if there aren't enough energetic "extras" at the sides to support the central action.

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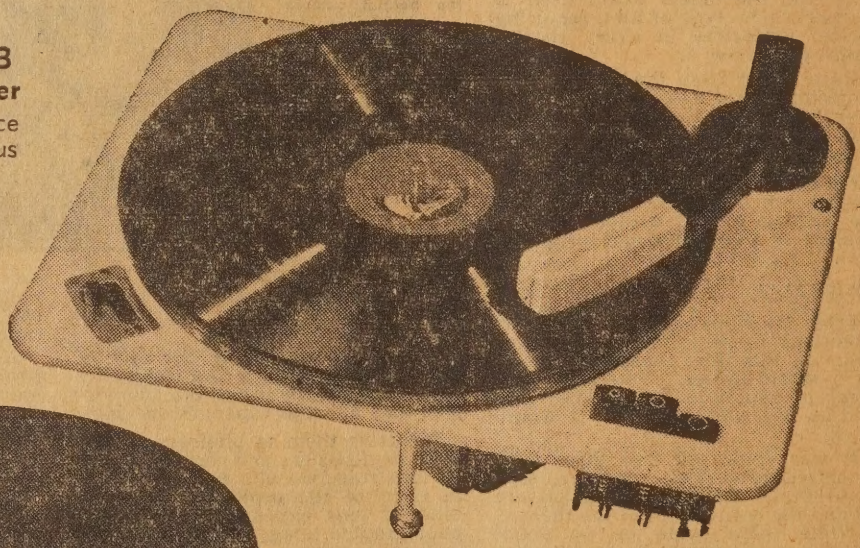

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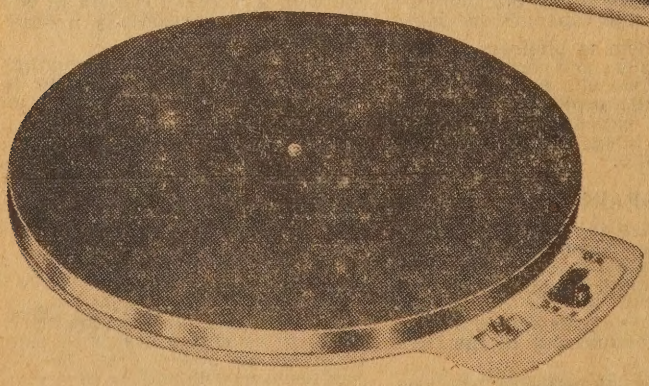

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FRICTION IS A USEFUL FRIEND

EXPERTS in these matters have an expression for friction. They say that it is a force which opposes relative motion between two surfaces in contact.

In fact, what the experts are saying is that any time you try to do anything, friction tries to stop you.

How pleasant and restful, therefore, how free from effort and fuss would life be if there were no such thing as friction! In the motorist's dreams he would achieve a fabulous number of miles per gallon with his engine unhampered by the drag of friction.

The cyclist also sighs for the beautifully easy travelling he would enjoy if his machine ran without friction.

The industrialist knows that it costs him huge sums of money every year to overcome it. Even in daily life at home friction levies its toll from the housewife, who is continually fighting to get rid of it in a thousand different ways. How nice to be permanently without it!

Without friction between bow and strings, this little man could not grow up to become a famous violinist.

In a thoughtless moment, one might be excused for dismissing friction as one of the curses of our existence. How easy everything would be if it were not there to slow up our machines and wear them out in the bargain.

WATER IS EASY!

Of course, when man took to the water he found that friction had apparently ceased to exist. He was wrong, though. Naturally, it decreases enormously in water, because the drag of a solid body against a liquid is the merest fraction of what it is between two solids. (This, incidentally, is the secret of successful lubrication.) But, even in water, there is still enough surface resistance to be noticeable.

Rowing men do not insist on beautifully smooth boats for nothing, and most small boys at some stage in life find out by practical experience that the retarding effect of the rough texture of a bathing costume during swimming is noticeably and delightfully absent when it is removed.

"But surely," you will say, "surely the air has given us a friction-free medium in which to move about at will?" Intangible though it may be, air is still a fluid. As such, it opposes motion. Aircraft designers try to reduce its retarding effect not only be streamlining the shape of the aircraft, but also by using a polished surface for wings and fuselage.

AIR FRICTION

At near-and super-sonic speeds the effect of the air on the skin of an aircraft, due both to surface drag and to compressibility of the air, is very considerable. The whole aircraft is heated up and unless the pilot were refrigerated he would not be able to stand the heat.

So you can see from these few examples that in whatever element we move our life is a never-ending fight against friction. How nice if we could only be rid of it! Just think . . . .!

Just think, though, of the motorist. He might not, after all, be quite as happy as we imagine in a frictionless world. His tyres would not grip the road, so that however hard he pressed his accelerator he would not move.

Nor would the cyclist, however hard he battled. But that, after all, might be just as well, because neither would their brakes have any grip. They could neither stop, nor, mercifully, start.

This is in theory only, of course, because in fact without friction there would be no cars nor cycles, anyway. It is friction that holds the nuts on the bolts and the screws in the metal, and so in our frictionless dream-world the car, the bicycle, the machinery, the trains and the aircraft could not exist and we would have nothing to work for us.

Even the knots in the string which we might use in desperation to hold the bits together would not stay done up. Flies could not walk up window-panes, nor pencils write. Even the very act of walking would be impossible.

Without friction between our feet and the ground we would just have to stay in the same place—until, that is, we were caressed by the gentlest little breeze, when we would sail away like thistledown without power to resist, happy perhaps, but no longer very useful members of society.

So perhaps, after all, friction is not exclusively the arch-enemy we suppose.

IN WRONG PLACE

It is friction in the wrong place which causes the trouble. Like fire, friction is a good servant, but a bad

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3 Cover aligned ends with "Scotch" No. 41 Splicing Tape evenly and securely.

4 Trim off excess splicing tape. Cut into recording tape backing slightly, as illustrated by dotted lines. This eliminates sticky splices.

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master. A substantial part of human effort from time immemorial has been devoted to overcoming it where it is not wanted: we use it where it is wanted—that is, in almost every action and movement in our lives.

The conquest of unwanted friction is a threefold victory. Not only do we overcome resistance to motion; in addition, we defeat those two by-products of friction—heat and wear.

When two surfaces rub together, heat is generated. Savages and Boy Scouts make fire by rubbing two pieces of dry wood together long enough for them to get hot enough to burn.

And, have you ever thought why a match lights? It is for the same reason. When the match is rubbed along the box the friction makes one spot on the match-head so hot that it sets off the combustible element.

Think of the sparks flying off steel on a grindstone or from a locomotive's wheels spinning on the rails—friction generated the heat to set them ablaze. But, whenever heating takes place as a result of friction, whatever examples of this sort one may quote, to a greater or lesser extent it means that surfaces are being worn away.

That is how the other by-product, wear, comes into the picture. Wear and heat are inseparable companions of friction.

SOURCE OF HEAT

Where does the heat come from, and why does wear take place?

You have only to slide down a rope too fast to know where the heat comes from; also, unfortunately, perhaps to observe the wear on your hands.

In fact, what has happened is that the energy which your hands have absorbed when your weight overcomes the frictional resistance of the rope has been converted into heat. In a rather more spectacular way, the energy released by cracking the atom is also converted into heat.

The conversion of energy into heat, incidentally, provides the real reason why no one will ever make a true perpetual motion machine.

The idea has fascinated inventors and small boys for centuries, but no one has ever succeeded. As friction can never be absolutely eliminated, there will always be a tiny amount of heat generated by it in the working of the machine and a corresponding loss of energy will result.

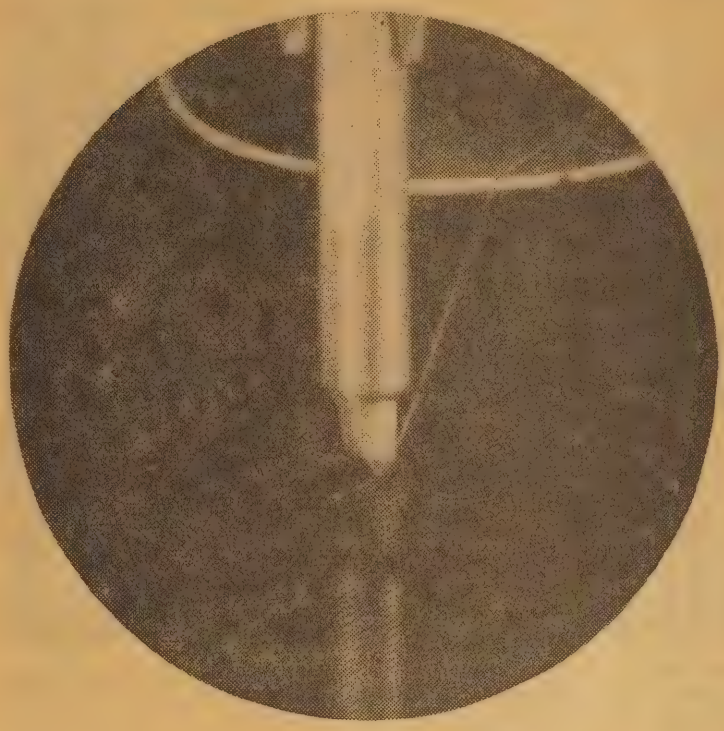
Slowly, this robs the machine of the energy first put into it to set it off, and in fullness of time it runs itself down. Though the wear in this case may be infinitestimal, the energy eventually gives out. The laws of thermo-dynamics are too much for it.

Those then are the results of friction. It remains to explain what causes friction itself, and then to see how we set about overcoming it.

The two so-called Laws of Friction, enunciated many years ago, but until recently not completely understood because they were arrived at quite empirically, stated that: the force of friction is independent of the area of the surfaces in contact; it is directly proportional to the weight which forces those surfaces together.

CAUSE OF FRICTION

The intricate instruments of modern science have at last revealed the causes of friction. We know now that even the most highly-polished surface, which to the unaided eye appears perfect, does, in fact, consist of little hills and valleys so minute as to be measured in millionths of an inch or even less.



The cutting stylus and recording disc are carefully prepared to reduce friction on playback thus reducing surface noise and wear.

We see that the hills and valleys of two surfaces interlock when they touch, so that when sliding occurs the tops of some of the hills are pushed over or torn off. Sometimes they will weld to one another, owing to the heat momentarily generated on the hilltops, thereby increasing the drag.

As sliding continues, such welds are immediately torn apart and new ones form, only to be broken in their turn. All this is on a scale so minute that only the most refined instruments can detect it.

That is friction — the interlocking and momentary welding of two surfaces. That also is the explanation of why there is heat and wear. How, then, do we set about reducing it?

It is obvious by now that if we can keep the two surfaces far enough apart that the hills cease to knock one another's tops off, or to weld to one another, then friction essentially disappears, and wear with it. And that is precisely the way in which all lubricants tackle the problem.

OIL VISCOSITY

In lubrication the most important single property of an oil is its viscosity—in other words, its thickness. There is an optimum thickness for each job. If the oil is too thin it will not be able to keep the two surfaces apart. If it is too thick, although it will separate them completely, too much energy will be wasted in just churning the oil around and that will heat it up.

Sometimes, of course, there are certain conditions of load and speed in a machine which are such that no ordinary mineral oil is capable of providing fully fluid lubrication at all.

The surfaces are pressed together so hard that no film of oil can remain between them. Then it is that the chemist has had to come to the rescue and design "oiliness agents" which can be added in small proportions to the oil to make it more effective.

The molecules of mineral lubricating oil can be visualised as little threads, each only a minute fraction of a millionth of an inch long.

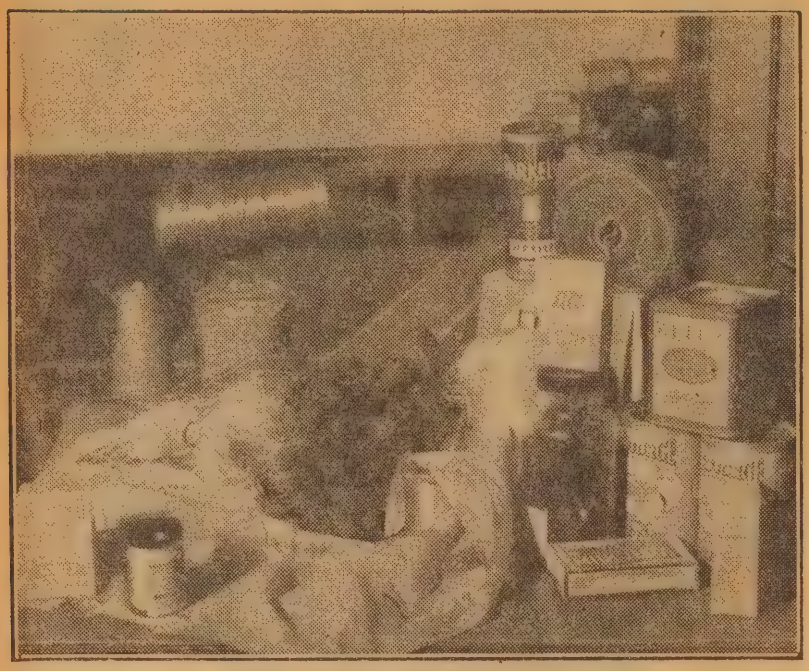
Oiliness agents are threads of about the same size, to one end of which the chemist has fixed a sort of chemical magnet which makes that end of the thread stick much more strongly to the surface, thus producing on it a miniature "lawn" of molecules.

Owing to their magnets, these molecules are not easy to scrape off, and when the loads rise to danger point and the mineral oil is nearly squeezed out—that is, when a state of boundary lubrication is approached—the "lawn" still manages to keep the surfaces apart by acting as a cushion over them.

In some machinery, however, even this is not enough. Under extremely high loads, such as can be found in the hypoid rear axles of motor cars, the oiliness agents get scraped off. So even more active chemicals have had to be devised which, when added to the oil, produce the so-called "EP Compounds".

With these, when the high pressure gets so great that the hills start rubbing, the high tempera-

(Continued on Page 23)



Some of the products of seaweed are shown here. Alginates are used in soups, jellies, custard powders, toothpastes, liquid soaps and hessian.

A FORTUNE IN SEAWEED

Seaweed is not a useless plant, as is commonly believed. It has many valuable properties which are of great importance to agriculture, industry and other phases of human endeavor. Foodstuffs, fertilisers, fabrics and dental "wax" are only a few of the surprising things which can be made from seaweed.

by Calvin Walters

IT is true that seaweed is not a particularly beautiful or inviting plant to look upon, especially when it is lying about the seashore.

Least of all is it attractive when, on a beautiful hot summer's day one proceeds to the beach to enjoy a surf, only to be confronted by an endless mass of seaweed strewing the beach and floating about in the water.

Such conditions are not conducive to pleasure especially in view of the fact that the weed is often the hiding place for all manner of undesirable "animals" such as bluebottles and dead fish.

Despite this, however, from the very earliest days, seaweed has been valued in various degrees.

SEA FERTILISER

In many parts of the world seaweed is considered to be equal to good farmyard manure for the fertilisation of soil. It was particularly valued at barley sowing time and the barley grown from it was highly esteemed by brewers. Today, of course, it is difficult sometimes to detect just what beer is made from. Many of us could give an opinion, which would have the backing of temperance societies, but it would doubtless be denied by the brewer.

Seaweeds are mostly of a green, brown or red color. They grow in great waving masses below the water and at low tide are often exposed above the surface.

The weed seems to serve no useful purpose (which is not correct as we shall see) and is a constant menace to rock fishermen by entangling their lines and tackle. There must be millions of miles of fishing lines and millions of tons of lead sinkers entangled in seaweed all over the world and a lot of it belongs to me.

To the beach visitor, it is mostly a nuisance but is occasionally useful to those who wish to imitate hula girls by wrapping it around their waists.

THE ALGAE GROUP

Seaweed belong to a group with the botanic name of Algae. There are many kinds of algae and they vary widely in their geographical distribution.

As mentioned earlier, seaweed has always been favored as a manure in agriculture. Its use for this purpose has declined with the discovery and introduction of artificial fertilisers but, in more remote countries, it is still used extensively.

It is also highly considered in some countries as a fodder and, as such, has a high nutritional value. In some coastal countries domestic animals are even turned out to feed on the seaweed which is exposed at low water. This method of feeding also provides the animals with salt which is so much needed.

The more usual method is to wash the weed in fresh water to free it of sand and excess salt, then to cut it up with a chaff cutter, subsequently mixing it with hay.

Another method is to dry the weed and powder it up into a meal. This is mixed with other meals and has a high nutritional value.

There is a species of weed called Laminaria which is used in Sweden for the purpose of making meal.

NUTRITIVE MEAL

The weed after collection is washed in lime water, in fresh water, and then treated to remove the iodine which is plentiful in seaweed.

The meal contains 50 to 60 pc carbohydrate. It is very high in mineral content of potassium, calcium, iron, sodium, phosphorus, and other minerals.

For centuries the dried seaweed industry flourished in many parts of the world and one of its chief uses was the extraction of potash, soda and iodine. However, the discovery of the nitrate deposits in Chile, with the later discovery that these contained iodine, dealt a blow to the dried seaweed industry from which it has never recovered.

So with these few words we will dismiss all these aspects of seaweed and proceed to review some remarkable present day uses to which this plant is put.

In 1884 a man named Stanford, of London, invented a new process of extracting iodine and salts from seaweed. This involved soaking the weed in water and removing the iodine and salts.

Although the weed was not altered in appearance by this method it was found that, after the removal of iodine and salts, it contained a substance which had not been noticed before. As the weed was an Algae, Stanford called the substance Algin.

By macerating the spent weed in weak hydrochloric acid and then soaking in sodium carbonate the weed, after 24 hours (broke up into a jelly-like mass which was solid enough to resist pouring and filtering. This was called sodium alginate.

ALGIN EXTRACTION

By using hydrochloric or sulphuric acid, the alginic acid can be separated. It precipitates into a flocculent mass which is washed and pressed into cakes like cheese.

These cakes are then stored and reconverted when required into the important sodium alginate, by dissolving in sodium carbonate.

By using various salts combined with alginic acid, important compounds are obtained. The importance of alginic acid is based on the properties of its salts.

For instance, all the alkali salts are soluble in water and possess a very high viscosity. They do not coagulate on heating nor form a jelly on cooling. They are clear, colorless and have no appreciable odor. The viscosity of these salts is easily controlled by the addition of calcium to the sodium alginate solution.

They can be made to set (or jel), however, by the addition of other salts.

It is these valuable features which make the salts of alginic acid so suitable for the manufacture of creams and jellies.

Combinations of the heavier metals with alginic acid form a plastic substance which is valuable in modelling for it is easily worked while wet but very difficult to dissolve after drying. It is also very hard after drying.

LEATHER DRESSING

A compound called sodium-ammonium alginate has 14 times the viscosity of starch. In a 1 pc solution it provides a much better dressing for leather and textile goods than other substances.

In the finishing of flannelette, sodium alginate is highly favored as it does not gum down the nap so desirable in this cloth. It is also used on mercerised cloth, satins and rayon for the finishing process.

In the manufacture of ice-cream sodium alginate plays a very important part. A quantity of the chemical in small proportion of 2½lb in 300 gallons of ice-cream permits the latter to whip more easily, prevents the formation of ice crystals during storage, prevents the separation of whey when the cream melts, and makes an altogether smoother product.

Sodium alginate stabilises emulsions by preventing separation of the constituents. It is also used as a thickening agent in the manufacture of jellies, custards and jams.

This ultra-fine woollen fabric, weighing only 1½oz per square yard, was woven on a scaffold of alginate yarn which was dissolved out after weaving. On the table can be seen the Bladderwrack weed in its raw state, ground seaweed in a container, alginic acid fibres, and a spool of yarn.

Testing the weight of a seaweed sample along the coast of Britain. Miss McLean Smith, B.Sc., was one of a team of scientists who surveyed 4250 miles of coastline.

The same salt is taking the place of gum tragacanth in the cosmetic and pharmaceutical industry. The latter is a gum used to thicken hair-fixing lotions and hand creams. Sodium alginate does this much better because the resultant product is colorless and transparent, whereas gum tragacanth mixtures are cloudy.

MEDICAL USES

In the medical field sodium alginate provides a suitable vehicle for the carriage of vitamins into open wounds, for taking impressions of the eyeball when making contact lenses, for sealing the bronchial tubes after draining tuberculous lungs. It also assists the formation of clots on raw tissue in wounds and has the advantage that it does not interfere with the use of penicillin.

Sodium alginate is used in dentistry to make impressions of the gums for dentures.

This valuable and remarkable salt is even used in the rubber industry for the creaming of latex. It is used in the paper industry as a cement.

An interesting application is in the manufacture of alginate foil for wrapping chocolates and so forth. This foil is made by forcing the sodium alginate through a narrow slit into a solution of sulphuric acid, which hardens it into a thin sheet. These thin films may be joined together with ordinary glue instead of by heat sealing, as with other similar materials.

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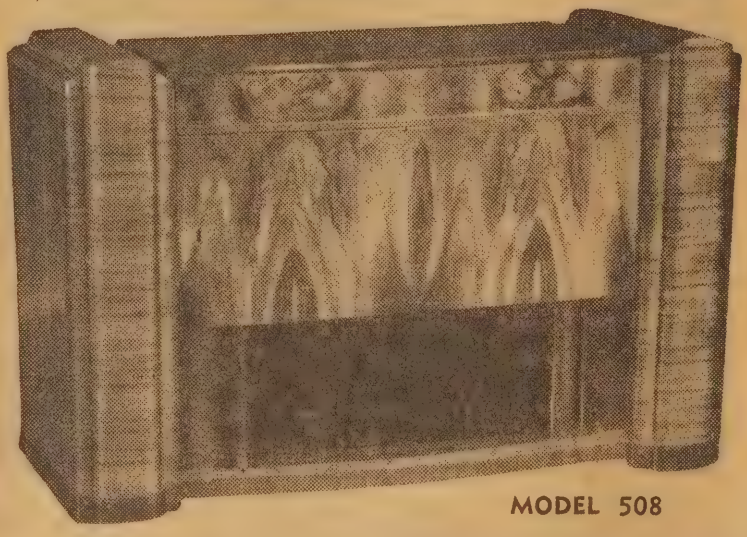

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BRITAIN'S SEAWEED HARVEST

During World War II an opaque paper was made from sodium alginate. This paper was soluble in water and therefore was extremely valuable for secret documents which could easily be destroyed when necessary.

In the paint industry sodium alginate is used as an emulsifier in certain paints. By rendering the sodium alginate insoluble by treating it with acid it can be made into a waterproof varnish. It is also a solvent of shellac with which it forms a hard, tough film of lacquer.

Almost as important commercially as sodium alginate are the salts of calcium alginate, barium and mercury alginates. These are insoluble salts and are used for the waterproofing of fabrics, waterproofing bricks, and making a hard rubber-like paint. They are used for making a plastic material which can be moulded into substances which are similar in appearance to linoleum or vulcanite. These salts are also useful for clearing beer, sugar solutions and soft drinks.

ARTIFICIAL SILK

However, the most important contribution to industry of these salts is the spinning and weaving of calcium alginate into artificial silk.

When acid is added to sodium alginate, alginic acid is formed. This is forced through a fine orifice called a spinnerette into a bath of acid. This solidifies the filament into a fine thread, which, after further treatment, is wound on spools ready for spinning into yarn and finally weaving into fabric.

The seaweed rayon, which has the greatest commercial use at present, is that which dissolves in an alkali such as soda. This is called a disappearing fibre in that, when woven in with other alkali resistant fibres, it can be made to disappear when the fabric is washed in soda.

The use of this will be readily seen in the case of embroidery where a pattern is woven into a fabric foundation base. This base was until recently one which is soluble in acetone. After the pattern is woven in the fabric, it is washed in acetone, whereupon the foundation fabric dissolves. This leaves the interwoven pattern behind in the form of a lace. The method is expensive and dangerous, owing to the unpleasant nature of acetone.

With the seaweed rayon as a base, it is only necessary to wash the fabric in soap and soda and the base dissolves away without effort.

In cloth where an open work effect is required, the seaweed rayon can be interwoven with alkali resistant fibres. In the scouring of the material the seaweed rayon dissolves away, thus leaving the open pattern in the finished material. This cannot be achieved by leaving the open spaces during the weaving as, during scouring, these spaces tend to close up.

FOR FINE YARNS

The recent appearance of very light weight wool-worsted fabrics owes its origin to the use of seaweed rayon. There has been a limit to the fineness of woollen threads which can be woven because of their weakness. If, however, a thread

(Continued on Page 111)

An extract of alginic acid from brown seaweed gathered on the Scottish coast being filtered in a laboratory.

Samples of seaweed are grown in tanks to assist in research into further uses.

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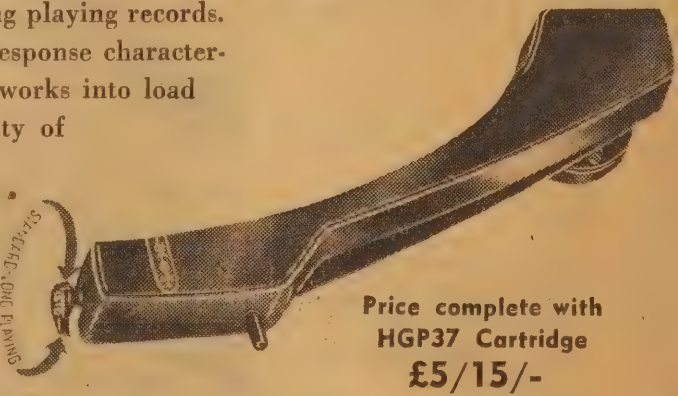

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Technical Review

AN INTERESTING OSCILLOSCOPE OF FRENCH DESIGN

The March issue of a French technical radio magazine TSF et TV carries details of a general purpose service oscilloscope which may be of interest to Radio & Hobbies readers. The circuit diagram is on the next page.

THE complete oscillograph is housed in a case of familiar and traditional shape, with the tube face visible at the top of the panel and the various controls and input terminals dispersed alongside and below it. In this respect it closely resembles the current Radio and Hobbies 2in, 3in and 5in designs.

However, as indicated below and in the circuit, the major sections of the instrument are constructed as self-contained units, which merely interconnect by a few wires.

UNIT CONSTRUCTION

Thus the cathode-ray tube, Focus, Intensity and Shift controls are concentrated on a small panel, shown below as Sketch 2. This same assembly carries the voltage divider network for the "gun" and requires only the connection of supply and signal voltages to be completely operative.

It occupies the upper section of the instrument panel.

Sketch 3 shows the time-base and amplifier assembly, as used for normal audio testing. It carries the Coarse and and Fine time-base controls, the Synch. control and the two amplifier gain potentiometers.

Behind the panel is a sub-chassis carrying the three necessary valves and the associated coupling and time-base components.

No illustration is available for the power supply but this is presumably installed as a separate unit at the rear of the case. Interconnection of the three units would thus constitute a complete audio test oscilloscope.

Unit 5 is interchangeable in size with unit 3 and is intended presumably for alignment purposes. Installation of this alternative unit, for which details are not immediately available, allows the oscilloscope to be used for "Wobbulator" alignment of receivers and IF channels.

The complete circuit diagram, as shown overleaf, illustrates quite clearly the extent of the unit construction.

The circuit is quite easy to follow despite the French terms and color coding. The valves should be available from suppliers of Continental types but, obviously, other types could be substituted with only minor alterations.

At the top left is the CRO tube and controls and below it the power supply. The circuit arrangement is quite conventional, even to the use of one extended leg to the HT winding.

The time base and amplifier sections are likewise fairly conventional but there are a couple of neat tricks to simplify the panel controls.

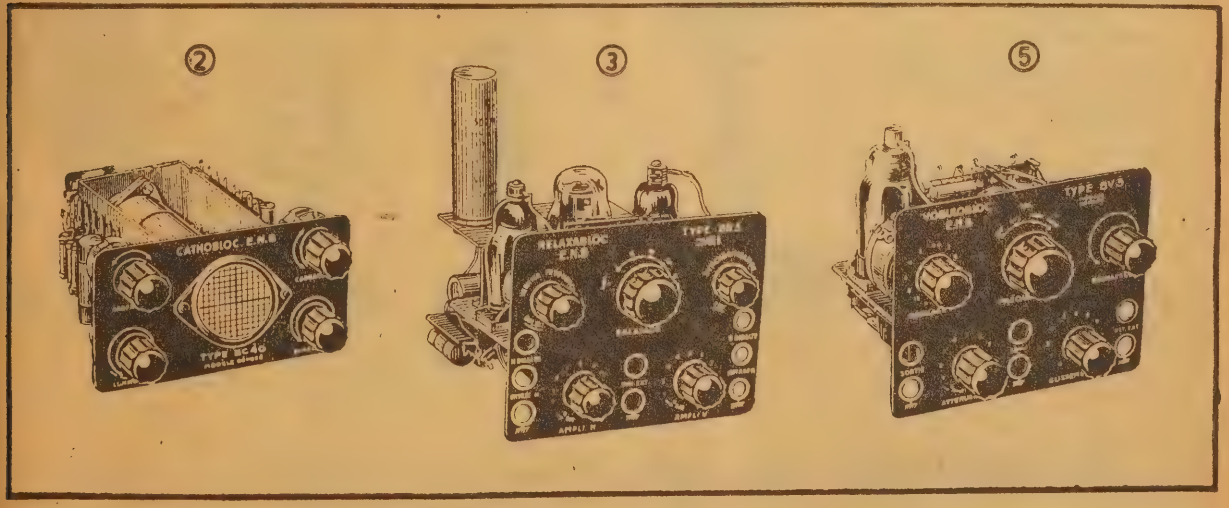
Of note is the use of deflection gain potentiometers with built-in off-on switches. When the gain control potentiometer is turned right off, the attached switch opens the connections between the amplifier output and its deflector plate, allowing RF signals to be fed to the deflector without capacitive shunting.

DESIGN FEATURES

The fine frequtncy control has a similar in-built switch which disconnects the time base from the horizontal amplifier when turned fully clockwise.

Similarly, when the coarse frequency control is turned to one extreme, it feeds a 50-cycle sine-wave signal to the horizontal amplifier, instead of the variable-frequency sawtooth pattern.

Without some such duplication in the function of individual knobs, the various connections have to be made



Novel point about this oscilloscope, intended for French servicemen, is the neat utilised assembly. On the left is the CRO tube and controls, centre the audio amplifier, sweep and deflection unit and, on the right, the interchangeable unit for frequency-shift alignment.

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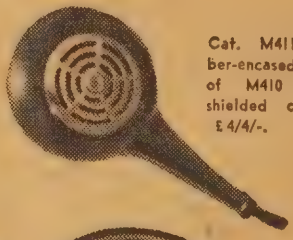
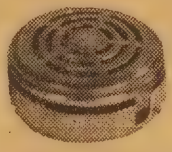
Qld. Agent: C. A. PEARCE & CO. PTY. LTD., 52 Bowen Street, Brisbane. B5860—B7161

Cat. T30: Hand or desk microphone, fully shielded, 4ft cable, £3/12/-.



Cat. M411: Rubber-encased version of M410 with shielded cable, £4/4/-.

Cat. UNIO: Primary Geloso Piezo-electric insert, £1/10/7.



Cat. M410: As M409 but with highly plated R.F. shield, £1/18/6.

Cat. 409: For use as insert or microphone; plated front grill. £1/12/11.

Cat. 401: "Ball" type, stand mounted, crystal microphone, £6/16/1.

Cat. 401/V: Cat. 401 with volume control, £7/16/2.

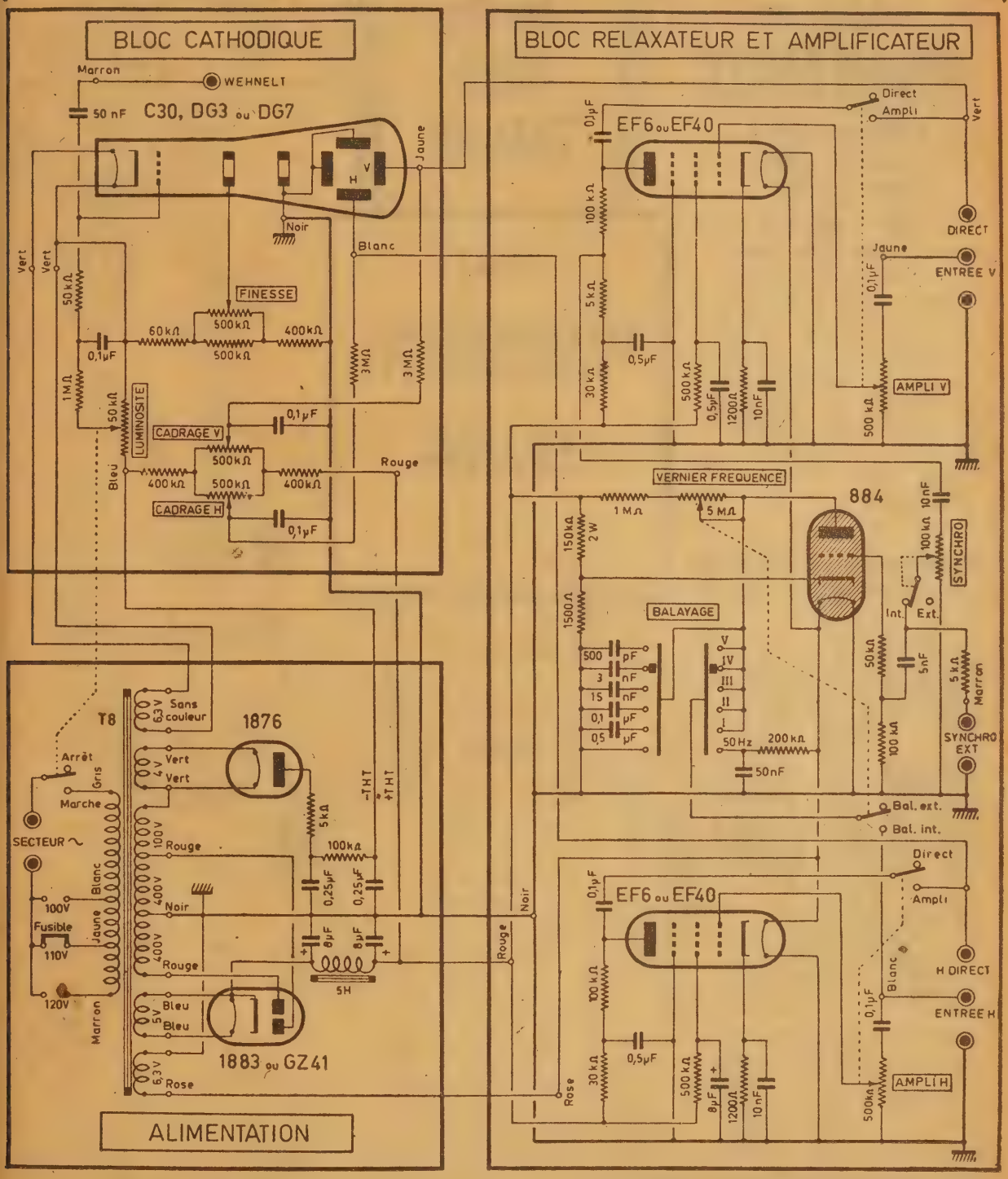
Cat. B/80/1100/V: Swivel cage crystal type, stand mounted, with volume control, £8/19/5.

Cat. B/80/416: Double ribbon microphone with line transformer, stand mounted, £17/4/6.

R. H. Cunningham Pty. Ltd. 118 Wattletree Road, Armadale, Vic., UY6274

3 Cambridge Road, Drummoyne, N.S.W., WA1615

FRENCH OSCILLOSCOPE EMPLOYS UNIT CONSTRUCTION



Readers who have learned some high-school French will be able to follow most of the wording and color coding on this circuit. However, French or no French, the function of the various units is easy to follow.

and broken by separate links or switching operations on the panel.

For the rest, the circuit could as easily have appeared with English captions and over the name of a local author. Its performance would be much the same as units available on the Australian market.

For those who may not have seen it, the magazine TST et TV is devoted entirely to technical radio and television topics. It is printed on art paper and some of the advertisements in the front section carry as much art-work, as much color and more surface varnish than we have seen before in a technical journal.

To judge by the content of the advertisements, the French radio industry is very much in step with the times.

EVERYTHING for the Radio Hobbyist

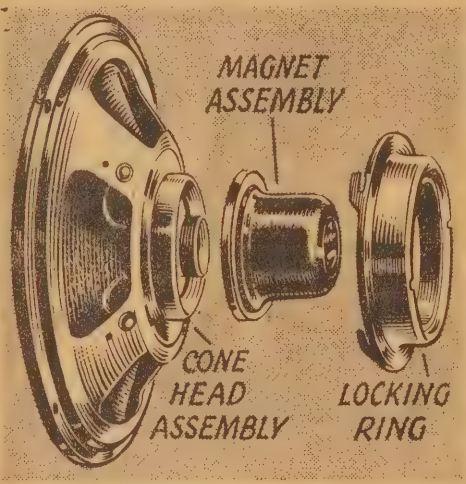
INSIST ON MAGNAVOX

PERMAGNETIC CENTRE POLE SPEAKERS

The ONLY Speakers with all these outstanding features

- Fully detachable and interchangeable cone head assemblies (See illustration.)
- Damaged cones easily replaced in 3 minutes.
- All transformers tropic proofed and interchangeable throughout the range.
- Full range of transformers with impedance clearly branded.
- Transformers held with P.K. screws —no drilling or punching—no nuts to lose.
- 5in, 6in, 8in, 10in, 12in speakers available with heavy or medium duty magnets.

SPARE CONE HEADS ALSO AVAILABLE FROM STOCK



NOTE THESE COMPETITIVE PRICES

MODEL	PRICE	MODEL	PRICE
525	43/-	8P1	63/-
6P2	54/7	10P2	67/3
6P1	58/11	10P1	72/9
8P2	57/5	12P2	72/4
		12P1	81/-

THE WARBURTON FRANKI PAGE

Check it each month

REPLACEMENT NEEDLES for ACOS GP20 and HGP40 Standard or Microgroove 14/3 fitted

SAME DAY SERVICE available also for CHANCERY, RONETTE, DECCA COLLARO SHURE, ASTATIC, PLESSY, B.S.R., ACOS, GP29 & HGP33 HEADS

MICROPHONES

Choose from W.F.'s Extensive Range of all Types . . . FAMOUS ITALIAN GELOSO MICROPHONES (illustrated below)

Cat. 1100/V; Swivel cage crystal type with volume control (right) £8/1/6

Cat. 400 "Ball' type crystal microphone (above) .. £5/19/11

Cat. 416: Double ribbon microphone with line transformer and switch (right) £15/15/-

Zephyr 8XA Crystal Microphone £7/14/3
(illustrated at left)

Not illustrated:—
Geloso T30 Bakelite case hand microphone £3/12/-
ACOS MIC35 Hand or Desk type Crystal Microphone £2/15/-
ZEPHYR 7XA Crystal Microphone for Hand or Stand .. £3/15/11
ZEPHYR 40 High Grade Ribbon Studio Microphone Grid or 50 OHMS .. £7/1/11
ZEPHYR 90 general purpose dynamic microphone Grid £11/6/3
50 OHMS £9/8/1

MICROPHONE STANDS

Tristand adjustable floor type £4/2/6
Adjustable Banquet type £3/17/-
Ministand combined Desk and Banquet type £1/0/10
Suction Cup Desk Stand 8/11

Write for illustrated pamphlets on all Zephyr and Geloso Microphones and Equipment

WARBURTON FRANKI (MELB.) LTD.

380 BOURKE ST., MELBOURNE, C.1... PHONE: MU6355

Open Saturday Mornings.

Trade Supplied.

POSTAGE OR FREIGHT MUST BE INCLUDED WITH ALL ORDERS

ANY ASPECT RATIO WITH A NEW PRISM-TYPE "LENS"

Newest aid to projecting wide-screen motion pictures in an anamorphic type projection lens, which is based on the use of prisms rather than curved surfaces. A major advantage of the idea is that the aspect ratio is continuously variable.

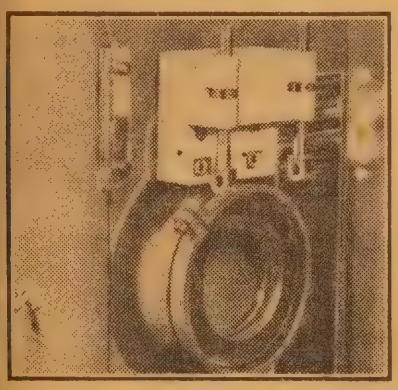
ANY type of anamorphic lens is expensive at the moment, initial units in this country costing several hundred pounds apiece. In the normal way, two such lenses are required by each theatre, one for each projector.

This initial cost, together with the need for new screens, &c., is likely to delay acceptance of Cinemascope films in the smaller theatres.

A further difficulty arises from the fact that the industry has not yet standardised on an optimum aspect ratio and fixed lenses which are designed for, say, 2.66:1, are completely unsuitable for films having an intended ratio of 2.3:1.

The new "Super Panatar" prism "lens" offers a part solution to the exhibitor's problems. While it is initially expensive, like the original anamorphic lens, it is fully adjustable for all ratios up to 2.66:1.

By turning a simple, calibrated knob, the projectionist can readily alter the "squeezing" effect of the lens to suit the film on hand. The unit can either be lifted out of the way for standard films or the knob rotated to the 1.3:1 position.



How the lens attaches to an ordinary projector. It can be fitted very simply to most projectors in current use.

The unit hinges on a metal block which normally attaches to the projector just above the main lens. Two small studs, screwing into holes drilled and tapped into the projector housing, are sufficient to hold it firmly in position.

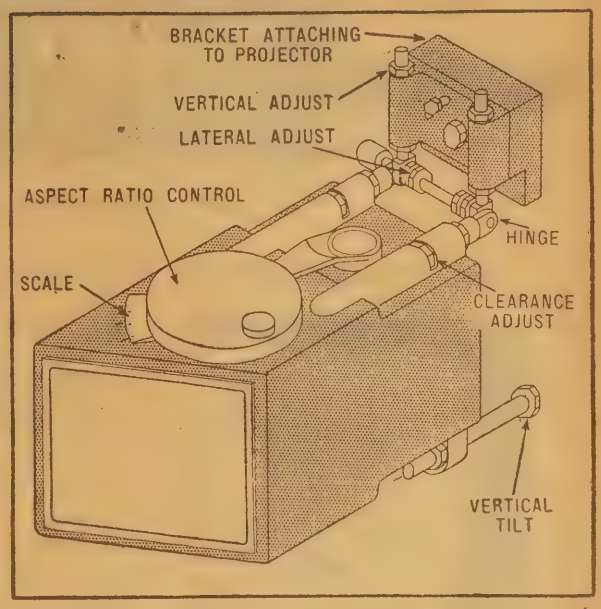
Hinging on this block, the lens unit can readily be swung upwards out of the light beam. When lowered into position, simple adjustments allow the angle of tilt to be varied through considerable range.

This can usefully be employed to correct optical errors which arise from projecting obliquely downwards on to a screen, as happens in many theatres.

☆

A sketch of the new prism-type lens for projecting films made in Cinemascope. The continuously variable adjustment available takes on the different aspect ratios used by special Fox films (e.g. The Robe and films made by other companies).

☆



Viewed from the auditorium, horizontal lines tend to droop and the effect becomes very noticeable on a wide, curved screen.

Suitable adjustment of the tilt angle of the new lens helps to correct this so that lines can be made to appear to be reasonably horizontal from any seat in the theatre, even though they may seem to veer upwards, when viewed from the projection booth.

As with the usual anamorphic lens, the new prism unit is substantially neutral in the vertical plane and the job of focusing is performed only by the standard projection lens.

This must therefore be selected to give an image of the proper vertical height, leaving the "Super Panatar" to spread the image horizontally as required.

When the new lens is added to the projector, the film gate is first opened and the dimensions of the projected light beam measured at the screen itself. Masking can be set, curtain positions determined and, at the same time, reference marks made on the lens adjustment knob for all aspect ratios likely to be required.

Once determined, the positions can then be selected again at will.

The manufacturers point out that a tolerance of about 5 pc is possible in horizontal dimension before distortion becomes noticeable on familiar objects.

With unfamiliar objects, titles, cartoons, &c., the lens can be sometimes operated to achieve a distorted but oftentimes amusing result.

FRICTION IS A USEFUL FRIEND

(Continued from Page 13)

tures at these points cause the metal to react chemically to produce a thin layer of material which is liquid at these spot high temperatures and so allows the conflicting hills to slide over one another without seizing or welding.

The range of lubricants available nowadays is vast. Each one is tailor-made for its particular application. The oil companies have continuously to be carrying out research in order to be able to solve the lubrication problems which arise in any mechanical operation—anything, for instance, from high-speed cotton spinning to heavy colliery winding-gear.

There even exist conditions in which no known lubricant made from oil is sufficient for the task. Especially is this the case with aircraft engines. Then our chemists have to step in and make one synthetically, as they have done for the latest jet engines. Whatever the stresses and the extremes of temperature encountered, the object remains the same; it is simply to overcome friction in the wrong place.

As we have seen, without friction at all, life as we know it would be impossible; but without proper lubrication, civilisation would equally come to an abrupt and grinding halt.

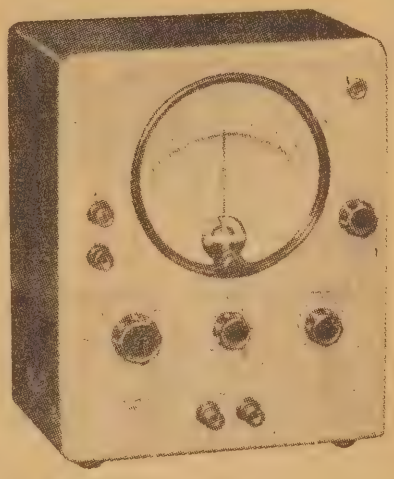
The planet Mercury revolves about the sun like the moon around the earth, presenting always the same face to the sun. Mercury's temperature in consequence stays more than 800 degrees Fahrenheit on one side and near absolute zero on the other.

BRÜEL & KJÆR

Electrical engineers

OF COPENHAGEN, DENMARK

Apparatus for Teletechnical and Acoustical Research



INSTRUMENTS FOR COMPONENT TESTING

DEVIATION TEST BRIDGE
Type 1502 and 1507

has been designed for use primarily in the production inspection of resistors, capacitors, and inductors. Operationally, the percentage of deviation of the component to be tested from a standard component is read on a large illuminated scale. The scale itself has two ranges. The indicating meter is of the moving coil type and is equipped with a specially constructed pointer to aid in reading. The Deviation Test Bridges have a very high indicating speed, making it possible to test as many as 4,000 resistors or 2,000 transformers per hour. The range calibration and the zero adjustment are readily performed by means of a built-in standard. The stability of these units is very high and readjustment of the standard controls is generally necessary only once a day.

SPECIFICATIONS

MEASURING OBJECTS FOR DEVIATION MEASUREMENTS	TYPE 1502	TYPE 1507
Resistance	10 Ω-10 MΩ	20 Ω-100 kΩ
Capacitance	50 pF-10 μF	25 pF-0.1 μF
Inductance	2 mH-100 H	100 μH-0.3H
MEASURING OBJECTS FOR DIRECT READING WITH EXTERNAL STANDARDS		
Resistance range from	0-0.7 Ω to 0-3.3 MΩ	
Capacitance ranges from	0-7 pF to 0-3.3 μF	0.7 pF to 33 μF
Measurement Frequency	1000 c/s	50 kc/s

INSTRUMENT: Large moving-coil instrument and illuminated scale with zero point in the centre. The instrument is safeguarded against overloads. Full scale deflection from — 7% to + 8% on one range, and — 25% to + 35% on the other range.

COMPARISON ACCURACY: Better than 0.1% at zero point.

TOLERANCE ACCURACY: Better than 5% at full scale deflection.

SPEED OF OPERATION: Normal production test is 4,000 resistors or capacitors per hour.

STABILITY: The zero point is independent of the line voltage.

AC-HUM: The bridge is not sensitive to hum voltages.

TUBES: 3x6AU6, 6AQ5, 6X4, OA2, and in Type 1507 also 6AL5.

POWER SUPPLY: 115, 127, 150, 220 volts a.c. 40-120 c/s. 40 watts.

DIMENSIONS: 33 (height) x 28 (width) x 20 (depth excl. dials) centimeters.

13 (height) x 11 (width) x 8 (depth excl. dials) inches.

WEIGHT: 9 kg or 20 lbs.

Sole Australian Distributors:

NATIONAL INSTRUMENT CO. PTY. LTD.

Head Office and Works: Aerodrome, Essendon, Vic. Phone FX 1571

SALES OFFICE: 134 Ferrars St., Sth. Melb. - Phone MX 1107

NC11

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SYDNEY: Airways House, cr. Clarence & Margaret Sts. - BO 229
BRISBANE: Compo Road, Rocklea East - - - - JW 2437

NEWS AND VIEWS OF THE MONTH

Small jet fighter

THE U.S. Navy has demonstrated the smallest jet warplane.

The plane is the single-seater monoplane Douglas 4D Skyhawk.

It is designed to carry later model atom-bombs.

The Navy did not disclose the plane's specifications but it is about 40ft long, with a wingspread of about 30ft.

That is less than half the size of many current jet fighters.

The plane is powered with a Wright J65 Sapphire engine.

It is designed for speeds of about 600 mph.

The tiny aircraft is being prepared for its first flight.

The Navy said its performance would be superior to many jet fighters.

★ ★ ★

Transistor telephone

THE first all-transistor telephone system is being operated experimentally by the Bell Telephone Laboratories at Americus, Ga., 135 miles south of Atlanta.

There isn't a single vacuum tube in the plant.

300 diminutive bits of the metal germanium are serving to bring better phone service to the area about Americus. The change from vacuum tube operation to transistors has resulted in cutting the overall size of the system to one-tenth of what would be necessary if vacuum tubes and their larger power requirements were used.

Talking dictionary

A TABLE-SIZED mechanical dictionary has been patented that not only defines the word sought, but also pronounces it through a loudspeaker.

Words and definitions are printed on cards bearing a strip of magnetic tape.

When a card is inserted in the machine, the word is visible to the user while a magnetic head reproduces the proper pronunciation.

★ ★ ★

Newest news

ALTHOUGH during the month several startling stories of flying saucers have been reported including some from Australia, the most startling thing about them is that nobody seems to worry.

For instance two Victorian girls said they were scared out of their lives by a strange object that virtually chased them around the back yard, descending low enough for inmates to be seen.

Now if that is true, we should really be trying to find out something about it. At the very least there should be public meetings and even a Royal Commission.

But everyone is at work as usual and not a ripple on the surface!

Can it be that most people don't believe in them?

And yet the Air Forces of both Britain and America say quite candidly that at least 10 pc of the reports could not be explained away, and they don't altogether scoff at the idea that the saucers come from outer space.

One can imagine the schoolgirls reacting under a too large dose of comic strips, but hard headed airmen aren't usually kidding. Or are they?

★ ★ ★

Analysing sound

A MACHINE has been developed that singers could use to analyse the pitch, tone, timbre, resonance, intensity, volume and range of their voices. If the singing is bad, the machine says so. And it says so with bits of information that pour in at the rate of 84,000 a second.

Although musicians could use the device for self-criticism, engineers had the industrial man, the mechanic and the technical trouble-shooter in mind when they created their "electronic ear".

The sound analyser can dissect a mysterious throb in a car for a garage mechanic. It could tell whether the unnatural noise was due to loose bearings or an unbalanced crankshaft.

The engineers report their machine has a battery of "parallel elements" that permit it to examine an entire spectrum of sound frequencies at once. It takes these sounds apart for study and presents its findings as 84,000 bits of information a second.

In a split second it can analyse the crash made by a hammer blow, or an annoying squeak in machinery. It can provide scientific evidence that

POPULAR SCIENCE QUIZ

Q.: What main element makes up a polar fog?

A.: Some experts believe that tiny ice crystals form the main element in some of the polar fogs, while others believe water droplets chilled to temperatures below freezing point, make up the main element. If this is true, the droplets may crystallise when they strike an object.

Scientists at the Stanford Research Institute in California hope that a new giant 500-pound camera which they have built may settle this scientific controversy and also pave the way toward better control over those tiny airborne particles that destroy clothing material, soil, the furniture and corrode car bodies.

The tiny solid or liquid particles, which can be as small as 2/25,000 of an inch, are magnified 80 times by the camera lens and recorded on a 5-inch by 7-inch photographic plate. They can be further enlarged 400 times.

From a photograph of a particle, scientists can measure their size and observe their shape in an attempt to deduce the source of the particle. They can then work out a solution to the pollution problem.

The camera's light source consumes up to three kilowatts of power. It can flash at a rate of 100 times a second and produce over 2-million candlepower. Exposure times range from one to 10-millionths of a second.

An ordinary fog yielding a visibility of 1000 feet has only about 200 particles in a cubic inch. A very heavy fog has about 2000 particles in a cubic inch. The camera "sees" a volume of less than 5/100,000 of a cubic inch, and, mathematically, neither of these fogs would have a particle in the field of view. However, since aerosol particles move rapidly in the air, multiple exposure should ensure catching the image of several particles on each plate..

Q.: Is there antagonism between various species of bee?

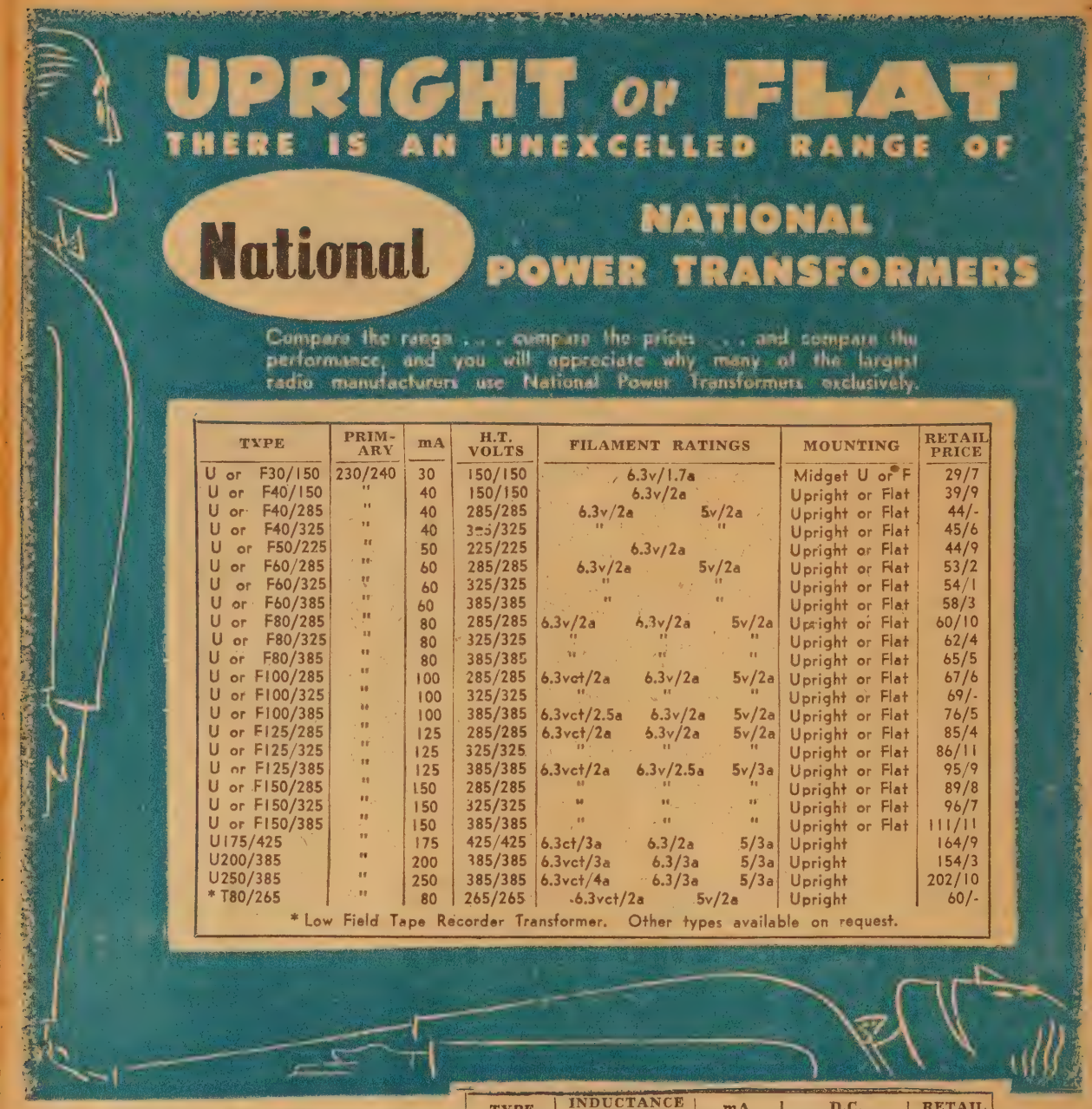
A.: According to Foreign Agriculture, various storming methods are used by wild Bolivian bees in a running warfare against imported honey-bee colonies in Bolivia.

One species squirts a pungent liquid on the honey-bees which destroys their natural odor. This throws the honey-bees into such confusion that they may start fighting among themselves.

Another species have a stinger so strong and of such a length that it can pierce a leather glove. Needless to say, when they strike a honey-bee colony, they overcome it in short order.

The most effective enemy of the little honey-bee is a large black bee armed with strong jaws. Though the honey-bees fight valiantly in defence of the colony, they usually suffer three times the casualties of the black giant.

Naturally, the Bolivian beekeepers are allied with the honey-bees in this warfare. The most effective defensive measure they have discovered is to capture alive some of the marauding wild bees, dust them generously with arsenic powder or ant killer and let them go. The poisoned bees return to their own hives and shortly afterward the pillage stops, probably because of the spread of the poison in the wild bee hive.



UPRIGHT or FLAT

THERE IS AN UNEXCELLED RANGE OF

National

NATIONAL POWER TRANSFORMERS

Compare the range . . . compare the prices . . . and compare the performance, and you will appreciate why many of the largest radio manufacturers use National Power Transformers exclusively.

TYPE	PRIM-ARY	mA	H.T. VOLTS	FILAMENT RATINGS			MOUNTING	RETAIL PRICE
U or F30/150	230/240	30	150/150	6.3v/1.7a			Midget U or F	29/7
U or F40/150	"	40	150/150	6.3v/2a			Upright or Flat	39/9
U or F40/285	"	40	285/285	6.3v/2a		5v/2a	Upright or Flat	44/-
U or F40/325	"	40	325/325	"		"	Upright or Flat	45/6
U or F50/225	"	50	225/225	6.3v/2a			Upright or Flat	44/9
U or F60/285	"	60	285/285	6.3v/2a		5v/2a	Upright or Flat	53/2
U or F60/325	"	60	325/325	"		"	Upright or Flat	54/1
U or F60/385	"	60	385/385	"		"	Upright or Flat	58/3
U or F80/285	"	80	285/285	6.3v/2a	6.3v/2a	5v/2a	Upright or Flat	60/10
U or F80/325	"	80	325/325	"	"	"	Upright or Flat	62/4
U or F80/385	"	80	385/385	"	"	"	Upright or Flat	65/5
U or F100/285	"	100	285/285	6.3vct/2a	6.3v/2a	5v/2a	Upright or Flat	67/6
U or F100/325	"	100	325/325	"	"	"	Upright or Flat	69/-
U or F100/385	"	100	385/385	6.3vct/2.5a	6.3v/2a	5v/2a	Upright or Flat	76/5
U or F125/285	"	125	285/285	6.3vct/2a	6.3v/2a	5v/2a	Upright or Flat	85/4
U or F125/325	"	125	325/325	"	"	"	Upright or Flat	86/11
U or F125/385	"	125	385/385	6.3vct/2a	6.3v/2.5a	5v/3a	Upright or Flat	95/9
U or F150/285	"	150	285/285	"	"	"	Upright or Flat	89/8
U or F150/325	"	150	325/325	"	"	"	Upright or Flat	96/7
U or F150/385	"	150	385/385	"	"	"	Upright or Flat	111/11
U175/425	"	175	425/425	6.3ct/3a	6.3/2a	5/3a	Upright	164/9
U200/385	"	200	385/385	6.3vct/3a	6.3/3a	5/3a	Upright	154/3
U250/385	"	250	385/385	6.3vct/4a	6.3/3a	5/3a	Upright	202/10
* T80/265	"	80	265/265	6.3vct/2a		5v/2a	Upright	60/-

* Low Field Tape Recorder Transformer. Other types available on request.

NATIONAL FILTER CHOKES

Incorporate many quality features including the latest winding technique, best quality materials, special lead anchoring which prevents lead coming out. Where covers are used, cooling louvres minimise temperature rise. All chokes are attractively finished with grey stoving enamel.

TYPE	INDUCTANCE IN HENRIES	mA	D.C. RESISTANCE	RETAIL PRICE
A.12/50	12	50	560	11/6
B.14/60	14	60	520	13/9
C.20/60	20	60	500	25/5
D.30/60	30	60	600	45/-
C.15/80	15	80	430	42/11
E.20/80	20	80	300	45/-
E.30/80	30	80	380	48/5
F.15/100	15	100	300	45/-
F.15/125	15	125	250	59/-
F.15/150	15	150	200	67/-
F.12/175	12	175	160	71/-
F.12/200	12	200	125	74/-
F.12/250	12	250	133	76/-

● Visit the Sydney Engineering Exhibition

July 5th to 10th, and see National's wide range of Power Transformers, Filter Chokes, Step Down Transformers, Fluorescent Ballasts, and Safety-Lite. All on display at Stands 26 and 27, Commemorative Pavilion, Showgrounds, Sydney.

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A NATIONAL PRODUCT FOR A NATION'S NEEDS

a violin is a Stradivarius, not a cheap fiddle.

The machine recently was displayed at the Institute of Radio Engineers meeting in New York.

★ ★ ★

Atomic engines

RESEARCH workers in USA are trying to develop an atomic engine capable of carrying a plane nonstop around the world, according to the National Advisory Committee on Aeronautics.

The agency also disclosed that current scientists were carrying out research into inter-continental guided missiles that would travel 6600 miles an hour or more than 10 times the speed of sound.

Atomic power plants would enable aircraft to fly non-stop at supersonic speeds to any point on the globe and return.

"Industry, the Atomic Energy Commission, the military services, and the N.A.C.A. are participating in vigorous, sustained attacks on the formidable technical problems that must be solved," the Agency said.

400 Government and industry officials, military leaders, and reporters yesterday inspected the N.A.C.A. multi-million-dollar research facilities, at Cleveland.

At the inspection the N.A.C.A. disclosed guarded details of its secret atomic energy program.

The N.A.C.A. said that the power and fuel requirements for tomorrow's supersonic warplanes would be so vast that long range could not be achieved with today's chemical fuels.

Aeronautical scientists said that a single pound weight of uranium could produce the heat of 2-million lb of petrol, or the energy of 3½-million lb of coal.

STAFF VACANCY

THERE is a vacancy on the staff of Radio and Hobbies for a technical journalist to design and build equipment and write general articles on radio for the magazine.

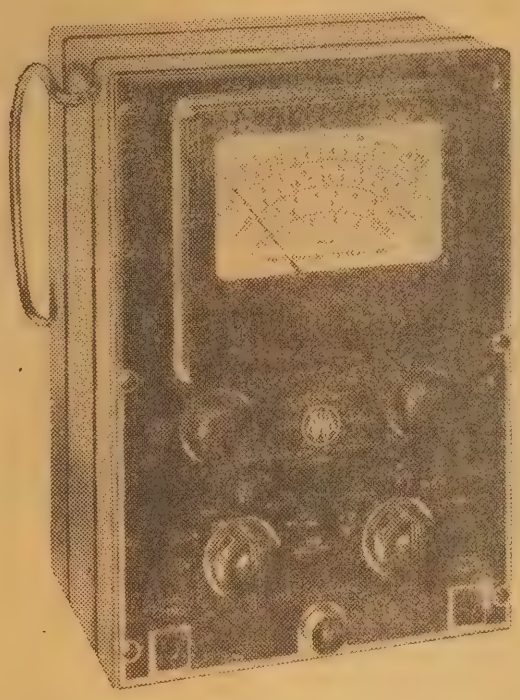
A good general knowledge of radio theory is essential. Experience in Radio Servicing, Transmitting, V H F communication and sound amplifiers will be an advantage. Prospects for the right man are good.

Applicants should be preferably between the ages of 20 and 25 years, with a good general education including mathematics and physics.

Applications should be made by letter to the Editor, Radio and Hobbies, Box 2728 GPO, Sydney, including copies of references.

AWA

VOLTOHMYST
A56010



WEIGHING ONLY 8½lb, this versatile instrument and its probes will measure all the voltage—r-f, a-f, a-c and d-c—to be found in normal communication, broadcast, or television equipment including the high voltages associated with the cathode ray tube. Further, the load imposed is so small that the voltages indicated are the real *working* voltages.

In addition, direct resistance measurements can be made on all the circuit components — coils, chokes, transformers, and resistors from low ohms to thousands of megohms — plus continuity checks and tests on condensers for leakage. D-C currents can also be measured directly.

Ranges and Facilities

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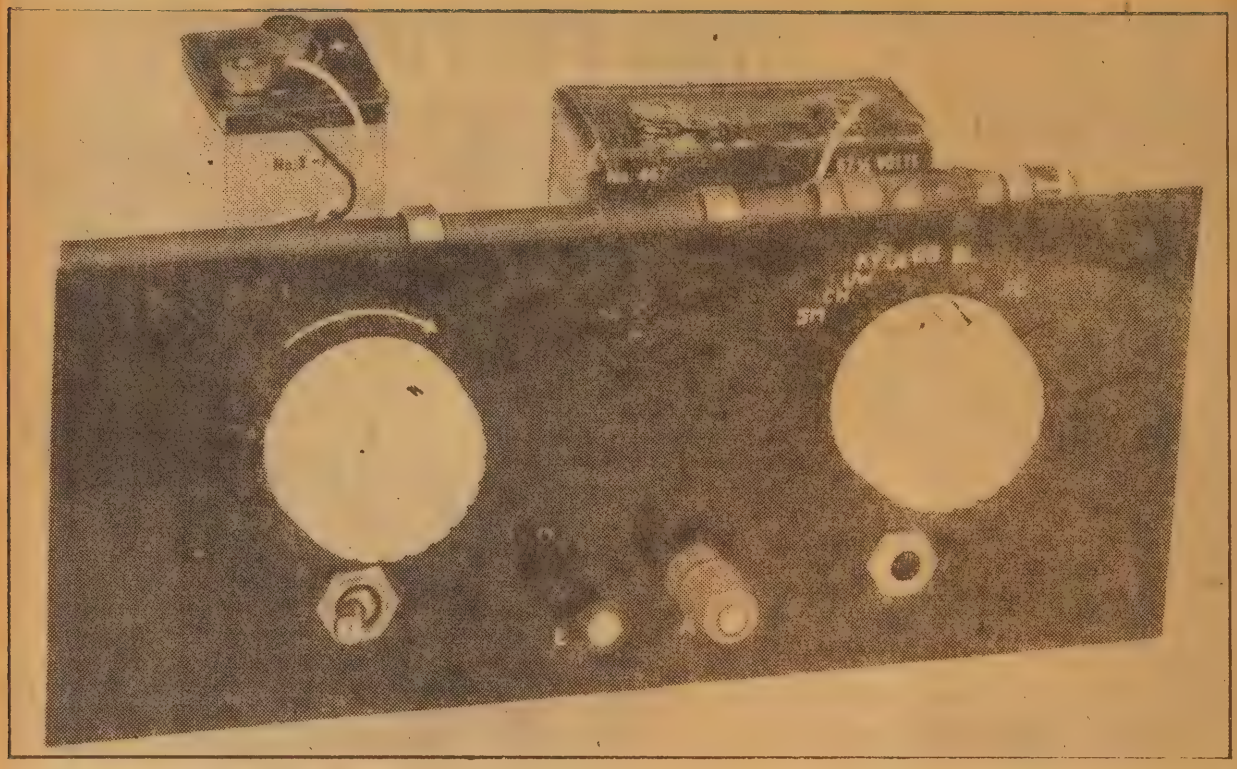


A front view of the completed set before fitting in a cabinet. The aerial rod may be seen just above the front panel, with the extra reaction winding on the right hand end. When housed in a cabinet the batteries would be laid sideways to conserve space.

A SET FOR THE BEGINNER

The well-known Reinartz one valve set is always popular but this month we have produced an interesting new version of it. Completely self contained, including the aerial, it is capable of a really surprising performance, yet is still simple enough to serve as an excellent "first set" for the beginner.

by Philip Watson

IN spite of the general acceptance of a four or five valve set as a minimum requirement for domestic listening, there always has been — and probably always will be — a very keen interest in what may be termed "little sets". One of the most frequent requests put to us by readers is for a one valve set or "something bigger than a crystal set."

These requests generally come from a young fellow who is just getting the feel of this radio business or a father who, with a similar outlook, wants to build a set for his young hopeful, the latter being perhaps a little young to tackle the job unaided.

CRYSTAL SETS

In either case it is likely that he has already constructed a crystal set and has probably come to realise that, instructive and all though these devices may be, they are strictly limited in scope.

It is true that they are cheap to build and cost nothing to run, but it is equally true that they will seldom play more than a few of the local stations at entertainment strength and that they need an efficient outdoor aerial and a good earth to do even that.

As a result he feels the urge to make something better; something that will not only take him a step farther in his hobby but which will also, when finished, be a useful little receiver in its own right. One of the most popular solutions to this problem is the one valve set and, in particular, the regenerative or "Reinartz" circuit.

The reason for the popularity is not hard to find, because these sets come closer to giving something for nothing than almost any other radio circuit. Simple and cheap to build, they are nevertheless capable of an impressive performance, particularly when one considers the single valve and limited associated components.

THE CATCH

However, since we seldom really get something for nothing, there are one or two "catches" which prevent this type of set being generally accepted in the commercial sense. The main one is that they require a greater amount of skill to adjust for best results than the conventional types, thus making them unacceptable to the average non-technical user.

Also, if we really stick to a one valve circuit, we must accept the limitation that the set will only operate a pair of headphones. There may be odd exceptions to this, in

favorable locations, but it must be generally accepted as true.

To the real enthusiast these limitations mean nothing. The skill acquired in tuning the set is something of which he can be proud and the headphone requirement, far from being a handicap, frequently provides useful privacy and freedom from annoyance to others.

Another reason for the continued popularity of these small sets is that the advances made from time to time in various components, and intended to improve the design of larger sets, have, in most cases, been equally helpful to the small set, even if unintentionally.

Thus the advent of more efficient valves, better coil designs, smaller batteries &c., have all, in their turn, provided a boost for this type of set, just when it appeared to many that its popularity was on the wane.

Such is the case with our present set, the advent of the Ferroxcube rod type portable aerial (sometimes referred to as a "loop stick") making possible a simple approach to the problem of providing a really self contained one valve set capable of good performance in an average suburban locality.

Most Reinartz sets use a standard aerial coil in conjunction with an aerial and earth; an arrangement which gives excellent results but which is obviously unsuitable for portable operation. One solution to the portable problem is to use a loop aerial, to which has been added a reaction winding, in place of the regular aerial coil.

LOOP LIMITATIONS

Naturally results will not be as good as with the conventional aerial-earth arrangements, but they are still good enough to give satisfactory results from most stations in favorable locations. The two main objections to such a scheme are, firstly, the rather large loop necessary to give good results and, secondly, the difficulty some beginners may experience in winding such a loop.

The Ferroxcube rod aerial makes possible a new approach to this problem. It has what engineers call a very high "Q" as well as a very high permeability, and these two characteristics are very important for good performance.

A simple explanation of the "Q" of a coil is that it is an indication of the coil's efficiency. Normally such a high Q is only obtained with a large hand wound coil, such as is usually specified for crystal sets, and the modern miniature coil sacrifices considerable Q in the interest of size.

PERMEABILITY

Permeability is best explained by regarding it as the magnetic equivalent of conductivity. This is a very broad statement, but it will enable the beginner to get some kind of an idea of how it works.

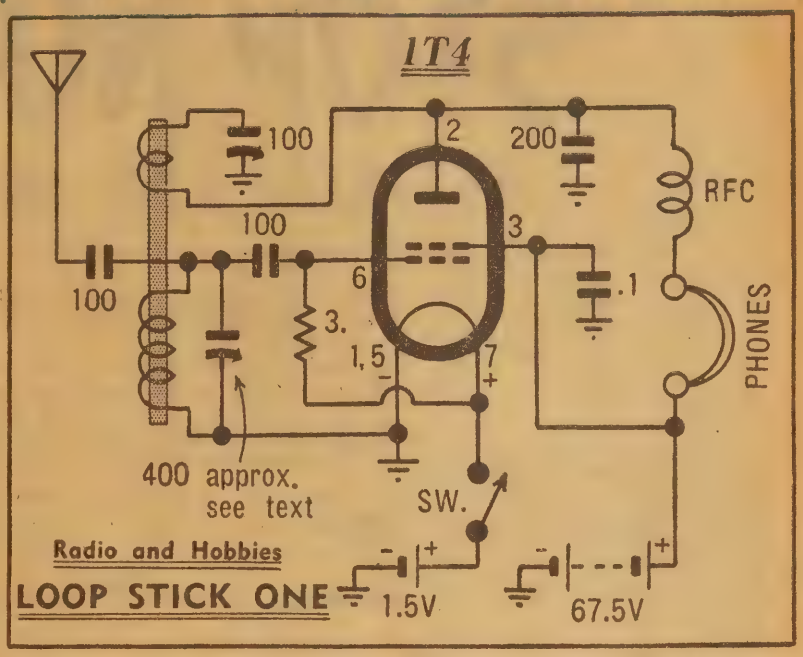
In the normal way we try to intercept as many magnetic lines of force — representing the radiated signal—as possible and use as large a loop as we can conveniently accommodate for this reason. In the case of the Ferroxcube rod the high permeability distorts the pattern of the magnetic lines so that many of them are concentrated in a small space. In other words, instead of going out to find our magnetic lines with a large loop, we bring the magnetic lines in to be just as effective on a small loop.

Having tried these devices in a number of portables and noted how efficiently they performed, the idea occurred to us that it might be possible to adapt them to the ever popular Reinatz circuit and produce a completely self-contained set with a high order of performance.

Admittedly the aerial as sold commercially has no feedback winding but there appeared to be no problem in fitting one, even for a beginner, and this was the only modification required.

The final performance of the set completely justified the experiment.

SMALL SET CIRCUIT DIAGRAM



A circuit diagram of our new one valve set. The circuit follows standard practice for such sets, but couples the aerial through a small valve of capacitance rather than a primary winding. Note also that the grid returns to the positive side of the filament circuit.

PARTS LIST

- 1 Chassis 7in x 1⅞in x ¾in.
- 1 Bakelite panel 9in x 3 11/16in.
- 1 1T4 valve.
- 1 Ferroxcube rod type aerial.
- 1 Single section tuning capacitor (370 to 420 pf).
- 1 100 pf midget variable capacitor.
- 1 200 pf midget mica capacitor.
- 2 100 pf midget mica capacitors.
- 1 .1 mfd 350 volt paper capacitor.
- 1 3 meg. ½W resistor.
- 1 Single pf RF choke.
- 1 Pair of high impedance headphones
- 1 7 pin miniature valve socket.
- 1 SPDT toggle switch.
- 1 Phone jack and plug.
- 2 Large white knobs.
- 2 Terminals, 1 red, 1 black.
- 1 3 terminal tag strip.
- 1 5 terminal tag strip.
- 1 X-71 or 950 cell.
- 1 467 battery.
- Pair of clips for 467 battery.

In a typical suburban location it was possible to play the eight local stations at moderate headphone strength without any external aerial or earth connections, providing the rod aerial was approximately broadside on to the station. Minimum pickup occurs when the rod is end on to the station.

Adding about 18in of wire to the aerial terminal removed much of the directional effect and increased the signal strength appreciably, while 3ft of the aerial wire almost completely removed the directional effect and lifted the signal strength to about the limit of comfortable listening. Longer aerials than this tended to spread the stronger stations unduly and would serve little purpose in such a locality.

However, farther out in the country, there would be no objection to a larger aerial and a good earth connection, possibly decreasing the value of the aerial coupling capacitor as the aerial size is increased. Another suggestion is to wind a simple primary winding on the rod in a manner similar to that which we will describe for the reaction winding.

AERIAL COUPLING

We had also made provision on the chassis for a miniature Reinatz coil and this was wired temporarily into circuit in the same location and the results compared. While probably no worse than one could reasonably expect from such a small coil they were so much inferior to those obtained with the rod that we more or less ruled this idea out. At the same time such a set should work well on a conventional aerial and earth system.

Readers familiar with sets of this type will recognise the circuit as a

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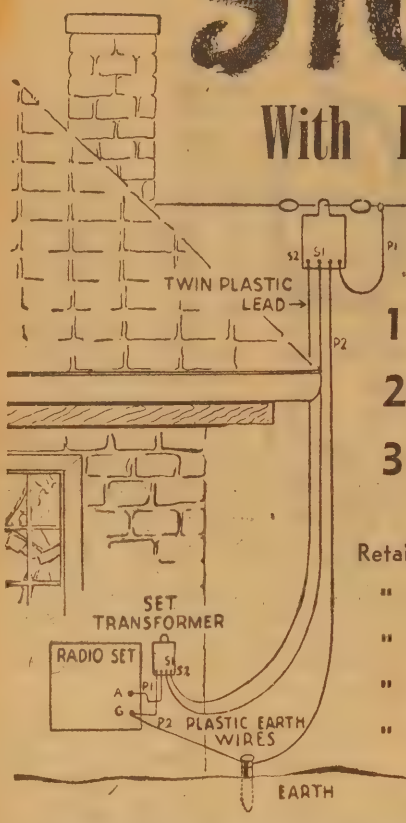

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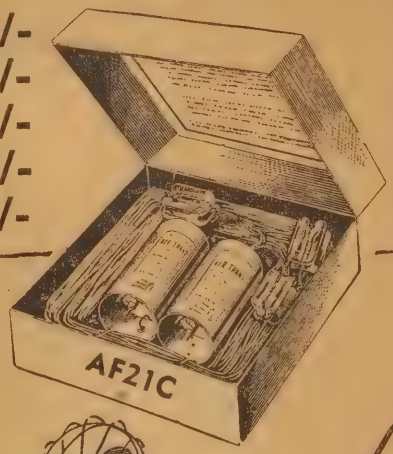

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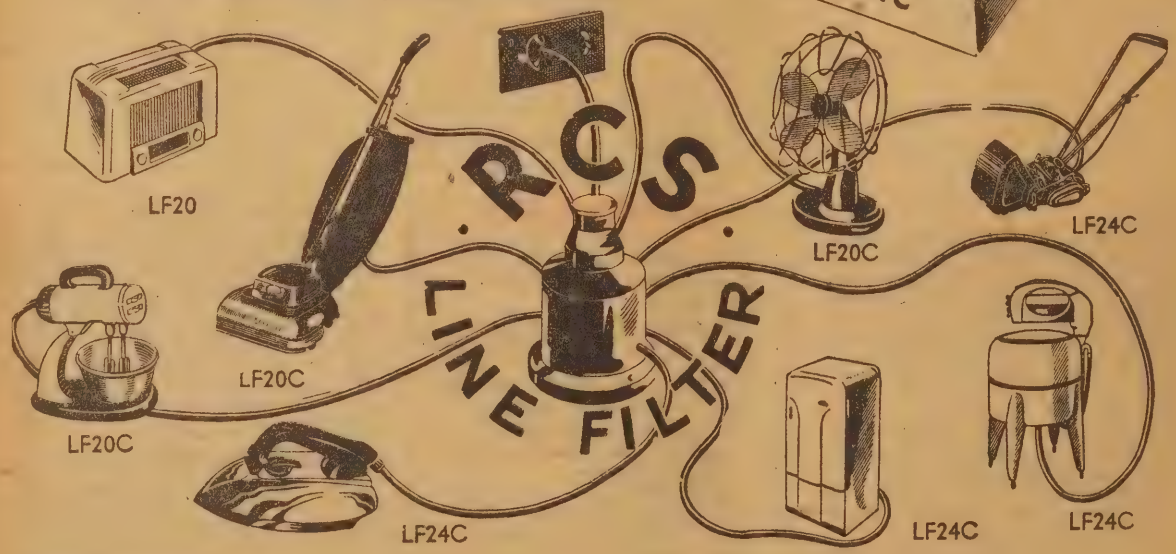

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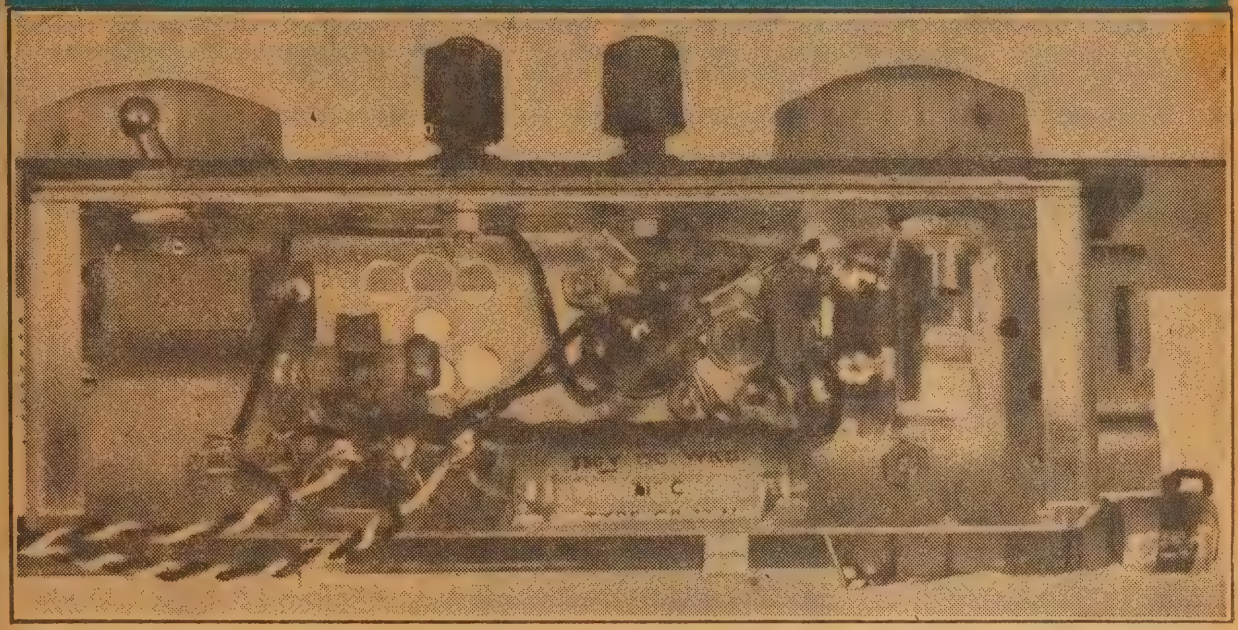
UNDERCHASSIS PICTURE OF BEGINNERS SET



This underchassis picture shows clearly the placement of the components. The toggle switch is on the left; slightly to the right the RF choke, and lower centre is .1 mfd bypass. The 1T4 socket is above it, to the right a tag strip and, extreme right, the phone jack.

perfectly standard version of the popular Reinartz arrangement. The only modifications worthy of comment are the absence of an aerial primary winding and the return of the grid resistor to the positive side of the filament, rather than the more conventional negative side.

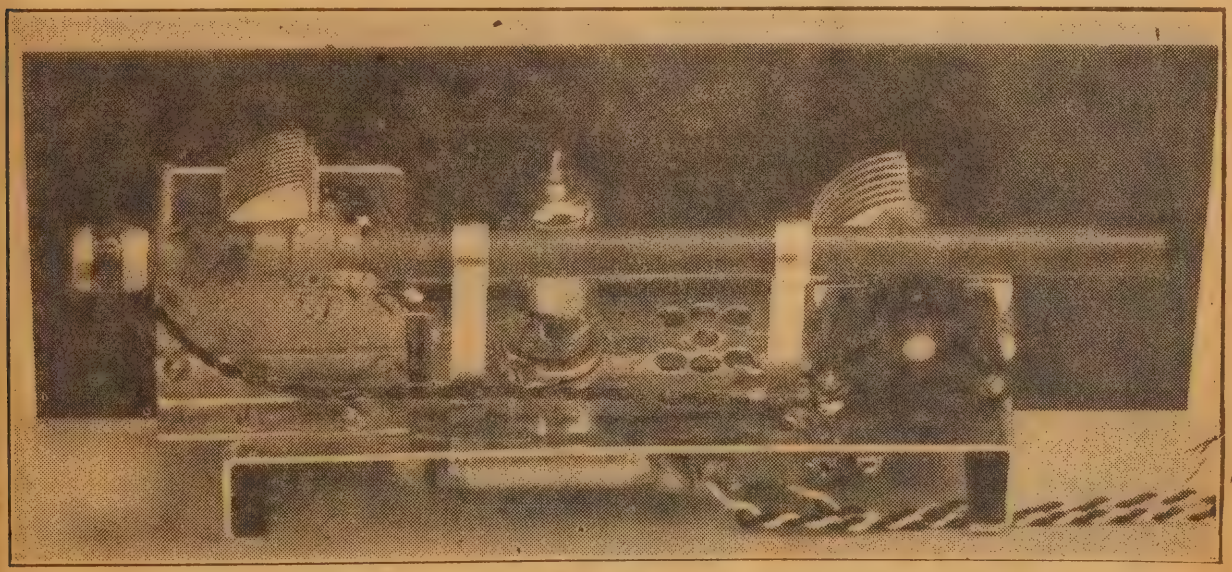
Since the rod aerial is not supplied with a primary winding we decided that it would be simpler to couple the aerial directly to the grid winding through a small capacitor, and this arrangement worked perfectly satisfactorily with the small lengths of aerial necessary in suburban locations. Where longer aerials are necessary smaller values may be needed or a primary winding may be added.

The grid resistor has been returned to the positive side of the filament because we found that, with the type of valve and value of plate voltage selected, it gave noticably better results. As might be expected, the HT drain is increased slightly, but the total is still low and not likely to cause concern.

The 1T4 valve which we selected appears to be the best in the current range for a set of this kind, all points considered. We did try a 3V4 and results were a little better, but only at the expense of twice the filament current and a similar order of increase in the HT current. Considering the slight improvement it did not appear to us to be justified.

To power the set we need a 1.5 volt filament battery and a HT battery supply between 30 and 67.5 volts. The best combination would appear to be one of the small rectangular cells, such as the X-71, for the filament and a miniature 67.5 volt battery, such as the type 467, for the plate supply.

In place of the X-71 it is perfectly feasible to substitute the more readily available 950 torch cell, the main objection being that connections to it will have to be soldered while the X-71 is fitted with screw terminals. The X-71 costs about three times as much as the 950, but should



A rear view of the chassis showing the aerial rod and other components above the chassis. The rod is supported on two simple brackets and the added reaction winding is clearly visible at the left hand end. Capacitor on the left is the tuning unit, that on the right the reaction control.

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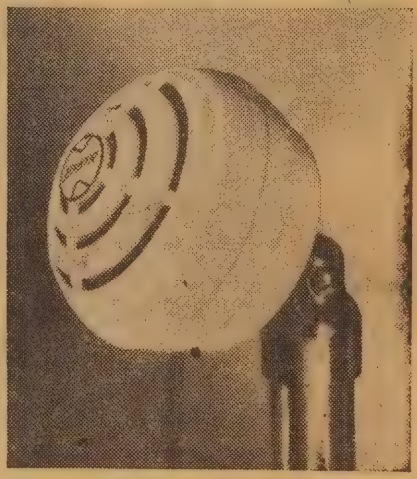

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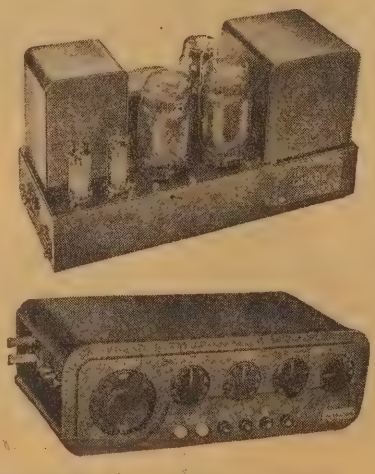

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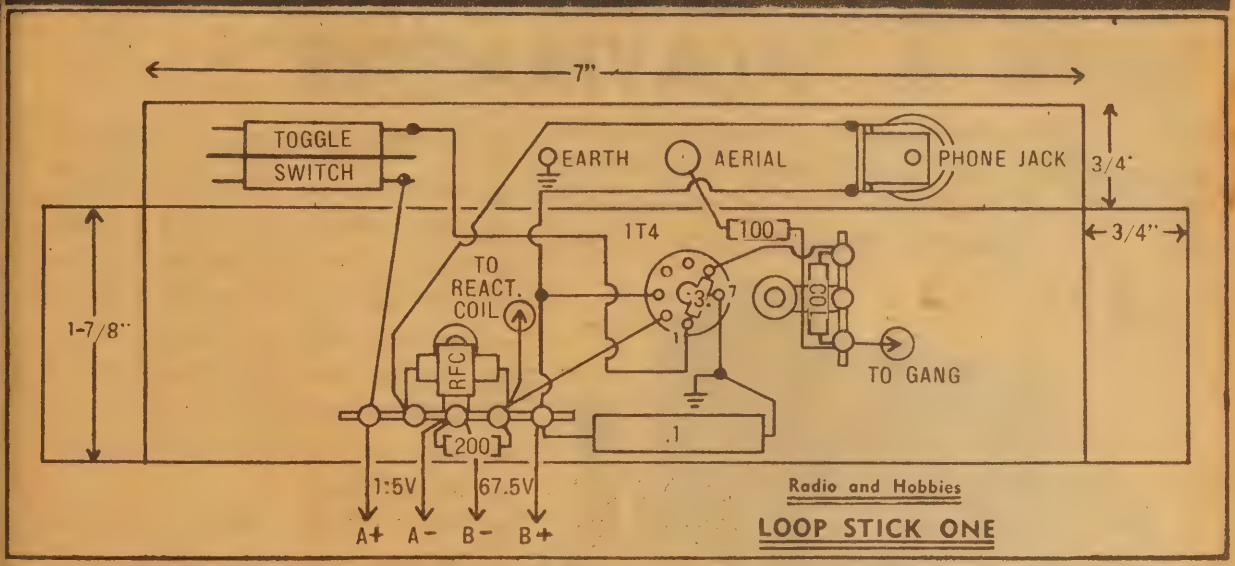
DIAGRAM SHOWS HOW TO WIRE COMPONENTS



This under chassis wiring diagram is intended mainly for the beginner who may have difficulty following the schematic diagram. As well as showing the placing of the components it shows the wiring between them, the orientation of the valve socket and the pin numbers. It is also intended to serve as chassis drawing, the necessary dimensions being included. Note that the actual lay-out may have to differ slightly if the components vary in size from the original.

give about three times the life, so there is little to choose in this respect.

When we commenced experiments with this set we had ideas about using one of the very small 30 volt batteries such as are available for hearing aids and photo-flash equipment. There is no doubt that the set will work from one of these, but a check with the battery manufacturers revealed that this is a very dear way to buy power for sets of this kind, plus the fact that the smaller types are not so readily available from the average radio shop.

All things considered we decided that the extra space and weight required for the larger type was completely justified.

The tuning capacitor is a single gang version of a readily available miniature unit, though there is no reason why almost any tuning capacitor should not be used providing allowance is made for its physical size. The unit we used has a maximum capacitance of 370 pf, a little lower than the usual value, but it is still capable of tuning from well above 2FC to a point beyond the high frequency end of the broadcast band where the police base transmitter is located.

A simple phone jack provides connection for the headphones, and is mounted on the front panel under the tuning knob. A toggle switch is mounted in a similar position on the left hand side of the panel and a pair of terminals, for aerial and earth connections, in the centre. The net result is nicely balanced panel.

The set proper is built on a simple aluminium chassis and we suggest that most amateur constructors should be able to construct something similar themselves from a scrap of 18 or 20 gauge aluminium.

Our own set underwent several changes in the course of construction, so that the chassis, as portrayed in the photographs, is rather shorter than might be desired. We, therefore, suggest the following di-

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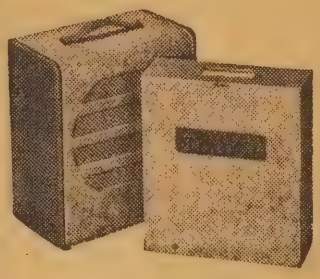

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nensions: 7in long, 1 7-8in wide and in deep. Although the chassis ends re shown with an extra ¼in turned nder. this refinement is not neces-ary.

The chassis is bent on three sides, he longer side forming the front, which mounts against the front panel. This panel is of bakelite and was chosen in preference to aluminium to avoid any shielding effects on the aerial rod. For the same reason the set should be housed in a wooden box.

The only component not actually mounted on the chassis is the variable reaction capacitor which, being one of the single hole mounting type, is most conveniently supported on the panel. In order to keep both shafts at the same level without increasing the height unduly, we mounted the tuning capacitor on its side, a small aluminium bracket serving to fasten it to the chassis.

The aerial rod is mounted horizontally above the chassis on a couple of simple brackets. While it may appear that a vertical mounting would have many constructional advantages it has been found that the rod works much more efficiently in the horizontal position. The coil is mounted near the tuning capacitor and a short length of bare tinned copper wire from the earth lug of the grid winding to a solder lug on the gang frame helps to keep the rod stable in the brackets.

The brackets are made from two strips of aluminium (or other metal), about ¼in wide, 3in long. About ½in of one end of each is bent at right angles and mounts on the chassis, the other ends being formed into loops which support the rod.

Be careful not to make these loops complete, or they will act as shorted turns around the rod and reduce its efficiency.

Also be very careful in handling the rod. The material is extremely brittle and a fall of only a few inches on to a hard bench can prove fatal. (We know; our first rod is now two rods, simply because the set tipped over backward on the bench.) Don't in any circumstances be tempted to use the rod as a former around which to bend the support brackets. Use a piece of metal rod the same size.

COIL WINDING

To fit the regeneration winding, it is necessary to provide a simple former over the end of the rod. This is made by winding a strip of paper about ½in wide and 6in long around the rod and fastening it in place with a piece of cellulose tape.

The winding itself consists of seven turns of 24 gauge B & S enamelled wire wound on the former and located about ½in from the grid winding. The exact gauge of wire is not critical, almost any size will suit, though it might be difficult to handle a heavier gauge on a former this size.

Cellulose tape is also used to hold the wire in place on the former and the two ends are left protruding a short distance so that they may be cleaned and tinned for connection to the circuit. The finished coil should be capable of being moved in relation to the grid winding to provide a means of adjusting the regeneration circuit.

The terminals we used required a ¼in hole to accommodate a "built in" insulating bush in ended to prevent the 1/8in metal thread from shorting to the metal chassis. An insulating washer, supplied with the terminal, is fitted between the nut and the metal. These precautions are necessary only for the aerial terminal, the earth terminal being intended to connect to the chassis. For this a ¼in hole in the bakelite and a 1/8in hole in the chassis is about the best arrangement.

The headphone jack also needs to be insulated from the metal chassis, since the frame of this device forms one of the contacts and the circuit requires that both sides be "above earth". The best arrangement is to drill a 3/8in hole in the front panel and a ½in hole in the chassis. An insulating washer is supplied with the jack and this is placed between the jack and the metal chassis.

HEADPHONE JACK

Some means must also be provided to keep the treaded portion of the jack central in the oversize chassis hole. If you can obtain a suitable spacing washer this will be the best arrangement but we used nothing more elaborate than a narrow strip of insulation tape wrapped around the thread.

Two tag strips are used under the chassis, one to mount the grid capacitor and one to terminate the battery leads. Due to the very shallow chassis it is necessary to modify these slightly, the mounting lug being straightened at its original bend and bent again at the edge of the insulating material.

With the wiring completed, it is advisable to check it very carefully before inserting the valve and connecting the batteries.

The best way to check is by means of a voltmeter across the filament pins of the socket with both batteries connected and the set switched on, but before the valve is inserted. Any sign of HT voltage between these pins indicates trouble.

If a meter is not available a small torch globe can be substituted for the valve filament for a preliminary test. If the globe survives it will be safe to plug in the valve.

CAREFUL CHECK

Assuming that the wiring is correct, the set should now show some signs of life and a small aerial should make it possible to hear at least one of the stronger stations. If you have been lucky with your connections to the feedback coil, the set should show signs of oscillation when the regeneration capacitor is turned fully into mesh, this being indicated by a sharp plop or a rushing noise.

Rotating the tuning capacitor while in this condition should bring forth a series of whistles as various stations are passed. By reducing the reaction a point will be found where the whistle ceases and the signal is clear and strong. The setting of the reaction control which will achieve this is fairly critical, and will need a little practice to get the hang of it if you have not tried it before. Each station will probably need its own setting of

(Continued on Page 106)

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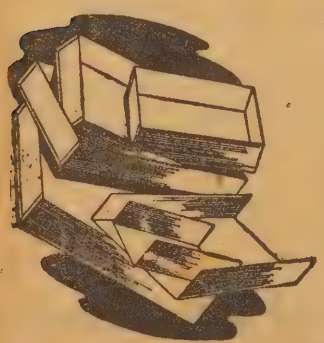

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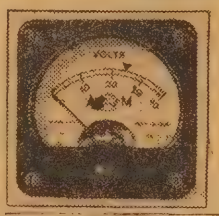

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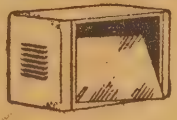

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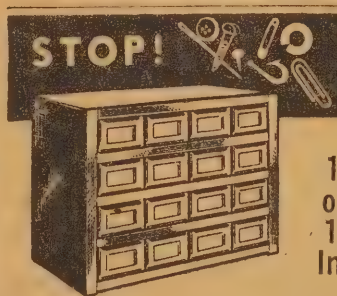
R4330	2250	6-100 watt/sec Flash	100 w/sec	12	3,500 Lumen/sec Flash
		Price £13/17/6			
R4340	2250	4-400 watt/sec Flash	400 w/sec	12	18,000 Lumen/sec Flash
		Price £21/17/6			

30,000 FLASHES. BLUE-WHITE SUITS COLOR FILM



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NSTABILITY

From my own bench I have the tory of a portable with a rather unusual fault. I am still trying to decide whether it had been tampered with or had always been like hat. Main reason for it being on ny bench was simply to confirm he owner's suspicion that the batteries were flat, but he also mentioned a rather mysterious whistle, which showed up only on odd occasions.

As is frequently the case with customers, I was unable to get any definite data from him as to what particular conditions produced the whistle. It was, as far as he was concerned, simply a case of "sometimes it does; sometimes it doesn't".

With a new set of batteries fitted the set worked very well, being a five-valve type with an RF stage and a reasonable size speaker. The difference between a set of this size and the ultra-midget personal portable never ceases to impress me, though presumably the improved performance is lost on the average teenager.

But, to get back to business. I tuned the set carefully right across the dial, listening carefully for heterodyne whistles which might be objectionable, but found nothing likely to worry even the ultra critical.

I came to the conclusion that the fault was due either to a particular locality or to the batteries which had been on their last legs before the set was brought to me. I decided to put the set aside until I could extract some more data from the owner and turned the volume control anti-clockwise preparatory to switching it off.

FEEDBACK CIRCUIT

At a point where the signal was weak but still audible, the speaker suddenly gave forth a low-pitched howl which, by its very nature, indicated audio feedback of some kind.

With a reasonably definite fault to work on I slipped the chassis out of the cabinet and commenced to examine the circuit. After getting my bearings my attention was drawn to the negative feedback circuit which was rather unusual for a portable, though employed frequently in larger sets, and with many variations.

Feedback voltage was picked up from one side of the voice coil, the other side being connected to chassis, and fed to the cold end of the volume control through a 100 ohm resistor. As such it represented about the simplest form of voice coil feedback, though it was obviously intended to be most effective at low volume. In all probability the speaker transformer produced a certain amount of phase reversal at low frequencies, thus tending to boost this end of the spectrum for low level listening.

In any case, it seemed fairly obvious that the intended negative feedback was, in fact, positive, but becoming strong enough to spill over only at the lower settings of the control.

SIMPLE CURE

But I was at a loss to explain how this condition had come about. The circuit did not appear to have been tampered with and the physical layout was such that it would have been extremely difficult to transpose the leads to the voice coil; assuming that the speaker had had to be removed for some reason.

A more reasonable suggestion was that the original speaker transformer had failed and that the person replacing it had failed to appreciate the need for correct phasing, (quite an easy thing to do if one was not familiar with such a circuit.)

The only point against this is that it did look as though it had been changed and, while I make no claim to second sight, it is usually possible to see where such changes have been made.

The only other suggestion is that the set had always exhibited the fault from the time it left the factory. In case this sounds far-fetched I can assure you that it would be quite possible.

In the absence of specific instructions to check this particular model at low levels it would be quite possible for the set to pass through all stages of testing with the volume control set to a position which gave near maximum volume. Considering the acoustic noise level of most factories this is not surprising.

It is also customary for the tester to simply connect battery sets to his bench battery as they are passed to him, then disconnect and pass them on to the next operator without bothering to operate the "on-off" switch.

In such circumstances it is easy to see how a set could slip through undetected, particularly in the early production stages of a new model before all the possible "bugs" of testing had been ironed out.

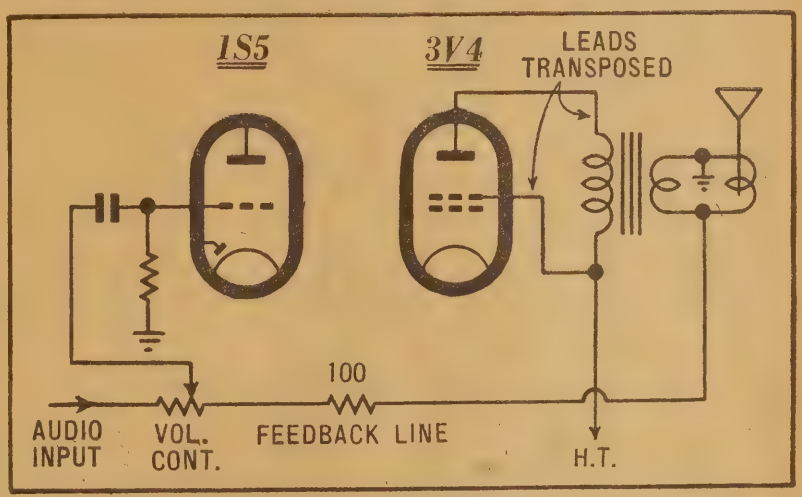
Anyway, whatever the explanation, the trouble was cured by the simple procedure of transposing the speaker transformer primary leads, thus restoring the phase to that intended by the designer. The result was a slight drop in overall gain and a small improvement in bass response when operated at "bedside" level.

The next job I am about to relate was rather a curly one. If anyone is under the illusion that this serviceman or any of his colleagues are incapable of making a wrong diagnosis let him read on for he will surely be disillusioned.

The case was in the nature of a rush job, being a portable PA system needed for an evening show by a group of entertainers.

The story was that it had failed on several previous occasions (whether completely or partly I was unable to determine) and had then returned to normal the next time it was tested. Now it had failed again and was wanted in a hurry. Could I do something in the couple of hours before the show?

I said I would do my best in the circumstances and prepared to tackle the job on a rush basis. I duly connected it to the power, waited for things to warm up, and spoke the usual "one-two-three" into the microphone. It was no wonder the users complained; the resultant sound was a woefully weak distorted version of the original and was virtually useless as any form of sound reinforcement.



A replaced output transformer had altered the phasing of the feedback network.

THE MIKE CIRCUIT

I slipped the chassis out of its cabinet and set it up on the bench for closer inspection. The set-up appeared to be a pair of 6V6's in push-pull, a conventional phase changer, main amplifier, and microphone pre-amplifier.

A voltage check showed nothing obviously wrong, all plate and screen voltages normal and nothing likely to cause the poor performance I had just witnessed. The only point in possible doubt was the HT voltage. This was close to 300 but I considered that it could be quite possible that

STANDARD -FERGUSON-

RECEIVER POWER TRANSFORMERS

CODE NO	PRIMARY VOLTS	HTV aside	HT mA	FILAMENTS
PF185	240	150	30	6.3V/2A
PF299	240	285	40	6.3V/2A, 5V/2A
PF300	240	325	40	6.3V/2A, 5V/2A
PF201	240	225	50	6.3V/2A

NOTE: All transformers are available with upright mounting. The following 9 transformers are also available with flat mtg., fitted with an adaptor plate to suit 3 x 3½in centres. On removal of plate, mtg. centres become 2½ x 3 1-8in. IF flat mtg. is required afix Code No by letter F e.g. PF151F.

PF151	230, 240	285	60	6.3V/2A, 5V/2A
PF166	230, 240	325	60	6.3V/2A, 5V/2A
PF165	230, 240	385	60	6.3V/2A, 5V/2A
PF170	230, 240	285	80	6.3V/2A, 6.3V/2A, 5V/2A
PF169	230, 240	325	80	6.3V/2A, 6.3V/2A, 5V/2A
PF168	230, 240	385	80	6.3V/2A, 6.3V/2A, 5V/2A
PF130	230, 240	285	100	6.3VCT/2A, 6.3V/2A, 5V/2A
PF164	230, 240	325	100	6.3VCT/2A, 6.3V/2A, 5V/2A
PF160	230, 240	385	100	6.3VCT/2.5A, 6.3V/2A, 5V/2A
PF152	230, 240	285	125	6.3VCT/3A, 6.3V/2A, 5V/2A
PF163	230, 240	325	125	6.3VCT/2.5A, 6.3V/2A, 5V/2A
PF181	230, 240	385	125	6.3VCT/3A, 6.3V/3A, 5V/2A
PF174	230, 240	285	150	6.3VCT/2A, 6.3V/2A, 5V/2A
PF142	230, 240	325	150	6.3VCT/2A, 6.3V/2A, 5V/3A
PF175	230, 240	385	150	6.3VCT/2A, 6.3V/2A, 5V/3A
PF167	230, 240	385	150	6.3VCT/2A, 5V/3A, 2.5VCT/5A
PF173	230, 240	425	175	6.3VCT/3A, 6.3V/2A, 5V/3A
PF140	230, 240	385	200	6.3VCT/3A, 6.3V/3A, 5V/3A
PF171	230, 240	385	250	6.3VCT/4A, 6.3V/3A, 5V/3A

POWER AMP. AND LOW POWER T/MITTER UNITS

PF172	230, 240	500	200	6.3V/4A, 6.3V/3A, 5V/3A
PF143	230, 240	600 500	200	2.5V/5A, 2.5V/5A, 5.5V/.5A
PF147	200, 230 240, 260	1000 750 500	200 250 300	5.5V/.3A
PF179	230, 240	475	225	6.3VCT/4A, 6.3V/2A, 5V/3A
PF107	230, 240	585	250	6.3V/3A, 6.3V/2.5A, 5V/3A

C.R.O. TRANSFORMERS

PF188	240	350 one ext. 900	30 2	6.3V/2A, 6.3V/1A 5V tap 4V/2A 4V tap 2.5V/2A
PF545	240	350 one ext. 1000	20 1	6.3V/3A, 6.3V/.6A, 4V tap 2.5/2A

TAPE RECORDING TRANSFORMERS

PF642	230, 240	250	80	6.3V/3A, 5V/2A Low radiation
PF664	240	265	80	6.3V/3A, 5V/2A Low radiation

PHOTOFLASH TRANSFORMERS

HT119	200	4000 ½ wave	
HT131	240	1100 ½ wave	prim. also vib, 5.2 or 4V

POWER CHOKES

CODE NO.	IND HY.	DC RES.	DC MA	CODE NO.	IND HY.	RES DC	DC MA
CF100	50	1900	10	CF112	10	70	250
CF101	30	870	25	CF113	5/20	70	50/250
CF102	15	300	60	CF115	.017	.6	2A
CF103	30	420	60	CF119	.005	.1	6A
CF104	30	580	80	CF162	10	90	330
CF105	15	250	80	CF196	20	130	125
CF106	12	200	100				
CF107	30	360	100	CF114*	40 watt fluor. ballest		
CF108	12	135	150	CF213*	20 watt fluor. ballast		
CF109	20	225	150	* Fitted with rubber mounting to			
CF110	12	100	200	reduce hum. Standard 5¼in hole			
CF111	16	165	200	centres.			

VIBRATOR AND

CODE NO	PRIMARY VOLTS	
PF182	240AC 12VIB	
PF122	240AC 6VIB	2
PF125	240AC 6VIB	2
PF126	240AC 12VIB	2
PF119	240AC 6VIB	?
PF146	200, 230, 240 AC 12VIB	

VIBR

CODE NO	PRIM VOLTS	DC Volts	O mA	(Fu...	
VT101	6	90	15	.008	
VT102	6	150	25	.005	
VT103	6	200	50	.005	
VT127	6	200	50	.005	Low radiation. Car Radios
VT104	6	250	60	.005	
VT107	6	250	60	.005	Low radiation. Car Radios
VT106	6	300	75	.008	
VT122	6	400	50	.005	
VT146	12 or 6	240AC	50w	1MFD	For Emergency light, etc.
VT112	12	200	50	.005	
VT132	12	200	60	.005	Low radiation. Car Radios
VT105	12	250	60	.005	
VT117	12	250	60	.005	Low radiation. Car Radios
VT114	12	300	75	.008	
VT123	12	320	125	.005	
VT113	24	200	50	.005	
VT116	24	250	60	.005	
VT115	24	300	75	.008	
VT119	32	150	25	.005	
VT100	32	200	40	.005	
VT124	32	250	60	.005	

FILAMENT TRANSFORMERS

CODE NO	PRIMARY VOLTS	SEC. VOLTS
PF118	220, 240, 260	2.5V/5A, 2.5V/5A
PF158	220, 240, 260	5V/8A
PF476	240	6.3V/3A
PF138	220, 240	6.3V/4A, 5V/4A, 2.5V/4A, 2.5V/4A
PF162	240	6.3V/3A, 6.3V/3A
PF154	200, 230, 240	7V tap 6V/7A, 6.3V/3A, 5VCT/5A 5V/3A, 2.5V/7A
PF102	240	7.5V/2A
PF111	240	10V/5A
PF211	200, 230, 240	10VCT/10A
PF131	230, 240	10VCT/10A, 5V/15A
PF123	240	15, 12, 8, 6V/1.8A
PF439	240	32V 60W Enclosed one outlet
PF457	240	32V 125W Enclosed two outlets
PF491	240	32V 200 W Enclosed two outlets

BATTERY-CHARGING TRANSFORMERS

CODE NO	PRIMARY VOLTS	SEC. VOLTS
PF265	230, 240	17V tap 11.5, 10, 8.5/4.2A
PF389	230, 240	17, 11.5, 10, 8.5V/4.2A, 17, 11.5V/4.2A 17, 11.5V/4.2A
PF537	240	17V tap 11.5V/0.4A

BELL TRANSFORMERS

CODE NO	PRIMARY VOLTS	SEC. VOLTS
PF648	240	10W Continuous or 2A Intermittent.

Fully enclosed including 240V socket and outlet terminals. Designed to operate local and imported chimes as well as various types of bells

IN ADDITION TO THE ABOVE RANGE, A STANDARD RANGE OF OUTPUT AND MODULATION TRANSFORMERS IS AVAILABLE

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e unit had been designed for this gure.

At this point I decided to check the microphone and associated circuitry. The mike itself was a typical moving coil type and was coupled to the amplifier through a fairly long twin shielded lead. Not having a similar mike handy I substituted a good quality crystal type which I knew would give similar results to the moving coil type when the latter was working properly.

Results from this were good, in fact as good as one could reasonably expect from the system. Just to make sure I switched to the moving coil mike again, then back to the crystal: repeating this several times. There was no doubt about it, the moving coil unit was sick.

I checked the mike cable and found that the earth lead connection to the plug was in a bad way. There was some doubt as to whether I broke the few remaining strands when I opened the plug or whether they had already parted, but I cleaned up this portion as a precaution.

SIMPLE CURE

The performance was no better, so, reasoning that there was nothing to lose, I opened the mike case and examined the works. All connections seemed intact so I tried exerting very gentle finger pressure on the outside edge of the small aluminium cone. At first the movement seemed unduly stiff until, with the application of a little extra pressure, I felt something "give". After this it appeared to be much more normal.

Exactly what happened I have no means of knowing and I can only assume that a scrap of magnetic dirt had found its way into the annular gap and effectively jammed the movement. Moving the cone with the fingers had freed it, at least temporarily, since it was a greater movement that it would normally encounter as a microphone.

I re-assembled the mike and checked the performance. There was a vast improvement and the only difference now noticeable between it and the crystal was the normal difference of the two types. There seemed little doubt that the trouble had been caused by the jammed mike movement and, after several test runs, I rushed the unit back to the owners, feeling that I had done my good deed for the day.

Imagine how I felt when the owner arrived back at the shop next morning, considerably browned off, with the story that the system had failed again almost as soon as it had been turned on and that the show had had to be carried on without it. Of the two of us I don't know who felt worse; he because he had been let down, or myself because I had let him down.

FURTHER TROUBLE

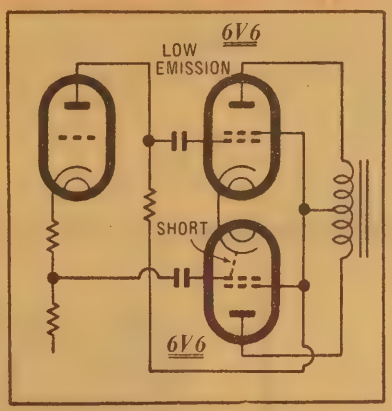
But it was no good crying over spilt milk and the best thing I could do was tackle the thing again and try to restore my reputation.

I set it up on the bench again and spoke my piece into the mike. The result was exactly the same as it had been at my first test, extremely weak and thin. I plugged in the crystal mike again and this time obtained from it results identical with those from the moving coil. Well, whatever the trouble, it was no longer in the mike circuit, even though it sounded the same.

Once more I pulled the thing out of its case on to the bench and tackled it with the voltmeter. This time there was definite evidence of something wrong, the HT voltage having dropped to just a little over 200. The plates and screens of the 6V6's read a similar figure, but something seemed amiss with one of the 6V6's, the grid showing a definite positive relationship to the chassis.

It appeared obvious that this was the cause of the reduced HT voltage though the exact reason for the positive grid was yet to be found. My first impression was that the valve had probably developed gas or, for some other reason, commenced to draw appreciable grid current. To check this theory I shorted the offending grid to chassis, expecting the HT voltage to rise with the removal of the positive charge. Instead there was an appreciable spark and a further slight drop in HT voltage.

This indicated that the source of positive voltage was of much lower impedance than the charge acquired due to grid current, and was more



A combination of faults gave our Serviceman a collection of headaches!

likely due to an internal short in one of the valves. It did not take long to confirm this suspicion, the offending valve suffering from an intermittent short between grid and cathode.

With a new valve fitted, the HT returned to its original figure and the set appeared to perform normally, but I was determined not to be caught again and, with more time at my disposal, set about giving the whole outfit a thorough check.

A "DUD" VALVE

First, as a rough and ready but reasonably accurate check that both 6V6's were doing their job, I pulled each out of its socket in turn and noted the effect on performance. While there was no doubt that the side of the circuit using the new valve was doing its job it was obvious that the other side was not.

I changed the valves over in their sockets and noted that the fault moved with the valves, thus indicating that the valve itself, rather than the associated wiring, was at fault.

A check in the valve tester confirmed this, the emission being well into the "BAD" region, and a second new valve restored the balance. It also reduced the HT to something like 265 volts, thus indicating that the original voltage of nearly 300 was due to low current drain by the sick valve.

The remaining valves tested OK and a more detailed voltage check and general "once over" failed to reveal any other troubles, so I fitted it back in the case ready for the owner, hoping that there were no more gremlins lurking in a corner of the chassis ready to wreck my reputation.

Summing up, then, there were four distinct faults in the equipment: (1) A faulty microphone; (2) a faulty microphone cord; (3) a 6V6 with an intermittent short from grid to cathode; and (4) another 6V6 with a low emission. The point which I find difficult to explain is: which one caused the unit to fail originally when it was brought to me?

SEVERAL FAULTS

There seems little doubt that it had been limping along on one 6V6 (or one and a little bit) for some time, and that the intermittent fault in the other one could easily cause complete failure from time to time. But where did the microphone fault come into the picture? Did it "just happen" when I commenced testing or was it the cause of my services being sought?

One explanation which occurs to me is that the intermittent grid cathode short had, on most previous occasions, responded to some simple "bush servicing", such as a good smack on the side of the cabinet with the palm of the hand, but that the mike fault, though it sounded the same, failed to respond to this treatment, thus indicating the need for more skilled attention.

Since no one knew that there was more than one fault I had fallen into the trap of believing that, having fixed one major fault, I had solved the problem. It is true that I may have done a better job had I tested the valves (though I could still have missed the short), but the urgency of the job, plus the deceptively obvious mike fault, had completely clouded the issue.

CHILDISH FUN

When the owner came to collect the unit I was able to provide at least a measure of explanation for the previous evening's untimely failure, the fact that there were three more faults, two of them possibly intermittent, helping to restore at least a little of my lost prestige.

And now I would like to relate a purely personal incident with a technical flavor. For my domestic listening I employ a fairly expensive, high quality imported speaker which, among other things, employs a small hemispherical radiator in the centre of the main cone. Although occupying the position of a dust cover in the more conventional speaker it really forms a vital part of the high frequency radiating system and is partly responsible for the excellent performance of these speakers.

The speaker is mounted on a simple baffle (purely as a temporary measure, of course, I will build that vented enclosure some day if I'm not talked out of it, or into something "better"), and, unfortunately,

(Continued on Page 111)

LEAK

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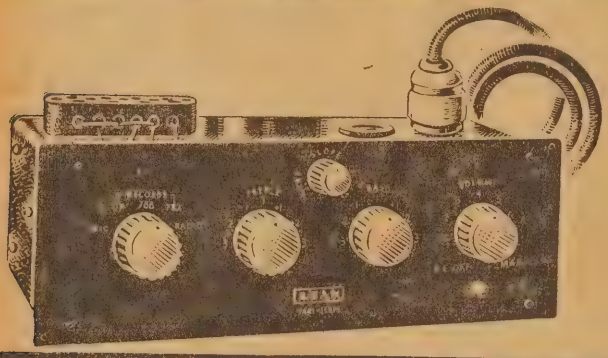

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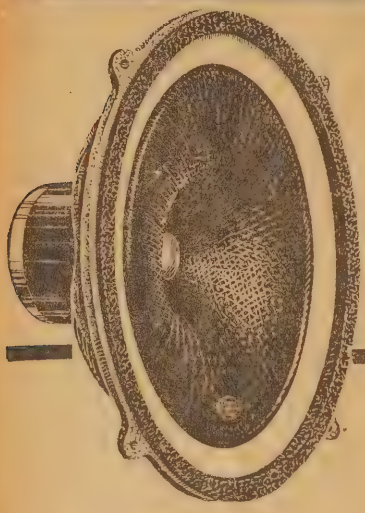

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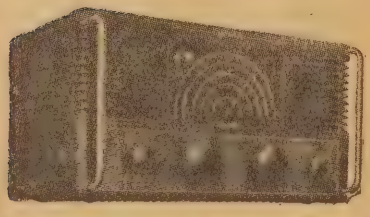
Suspension	Cloth
Effective cone Diameter	9¾in
Voice Coil Impedance (to order)	Standard 15 OHMS.
Fundamental Resonance (Approx.)	35 CPS
Frequency Range	18/17000 CPS
Flux Density (approx.)	15,000 lines per SQ. CM
Maximum Peak A.C. Input (Open Baffle)	15 Watts
Voice Coil Diameter	1¼in.

PRICE £26/10/5



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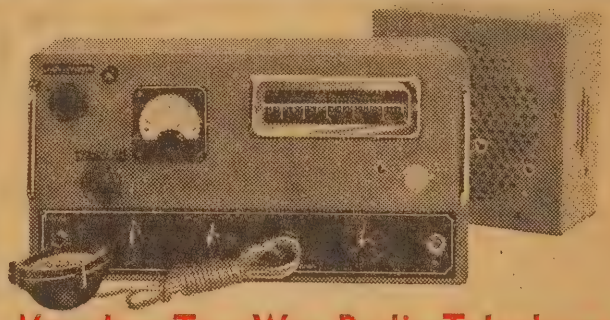

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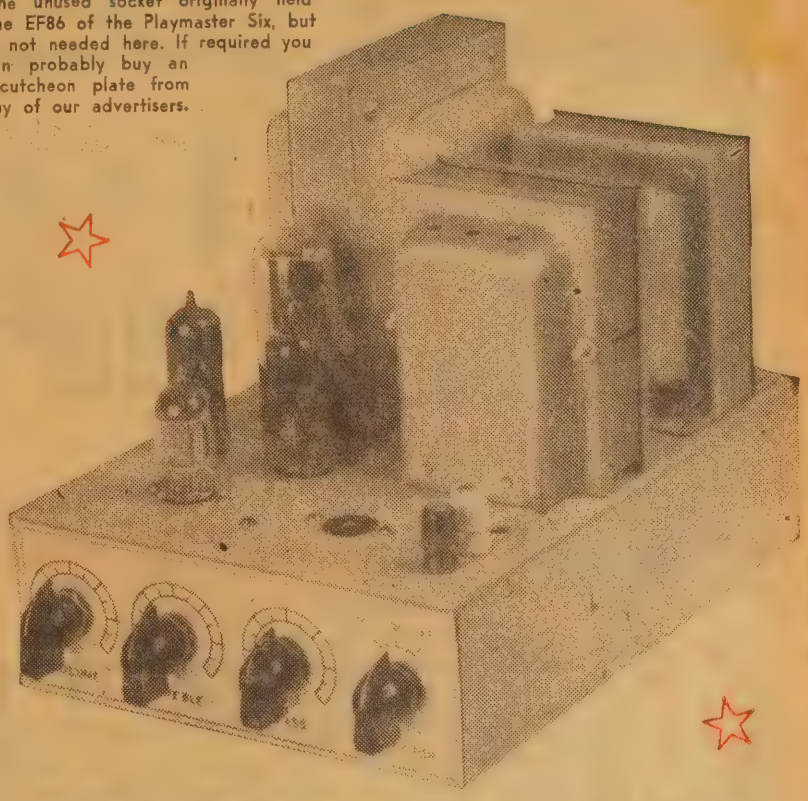
ONE of the advantages of a crystal pickup is its high output as compared with most other types. This fact has contributed largely to its popularity in the past, because it has been possible to use it with amplifiers of moderate gain and consequently simpler circuitry.

As we have mentioned previously, and shown specifically elsewhere in this issue, crystal pickups of modern design can be used with standard, low-input amplifier systems such as the Playmasters with complete success. This is done by employing compensating networks which not only smooth out their response curves, thus making them effectively better pickups, but lower the useable output to approximately that of magnetic and other types for which the amplifiers were designed.

It also allows the compensation settings of the control units to operate in the normal manner, and the pickup is thus effectively brought back to reference as compared with contemporary types.

There is another approach to crystal pickup amplifiers which we feel should not be neglected. That is to build an amplifier specially for them which will capitalise on this characteristic of high output, at the same time allowing adequate compensation for various types of records.



The unused socket originally held the EF86 of the Playmaster Six, but is not needed here. If required you can probably buy an escutcheon plate from any of our advertisers.

A CRYSTAL PICK-UP AMPLIFIER

Here is an amplifier we think many readers have been waiting for—a simple and effective design for use with crystal type pickups. It produces about 8 watts of high quality sound, has facilities for playing all types of records, and can be used with a tuner to make an excellent radiogram. It should fill the gap between low powered amplifiers and the more complicated, higher output types.

by John Moyle

If we are to avoid complication, and working back to the same solution as provided by the Playmasters, we must be prepared to compromise somewhat in the matter of compensation, to the extent of abandoning any attempt to duplicate exactly a given set of playback curves. But we will need a control which gives a degree of bass boost should it be required, another to provide treble cut specifically to offset the pre-emphasis used in microgrooves, and a third to take care of variations from one record to another, and in individual taste.

PLAYMASTER SIX

An amplifier which went part way along the road was the Playmaster Six. It simplified the compensation position to two continuously variable bass and treble controls, but it also included sufficient amplification to accommodate low output pickups.

As the circuit described here was based on this Playmaster Six, and is in fact the original amplifier "made over", we will base our discussion on it.

The original circuit used a pair of 6BV7 valves as a push-pull output stage driven by a twin triode, one half of which was a phase changer and the other half a voltage amplifier. There was a voice-coil feedback circuit running back to the first cathode circuit in the line, and the whole comprised the amplifier proper.

In addition, we used an EF86 pentode stage which, as well as providing more gain, carried the bass and treble compensation controls in its plate circuit. The user adjusted these according to the records he desired to play.

Now if this amplifier were to be used purely with a crystal pickup, it would be possible to dispense with the EF86 on the score of gain only, and feed the pickup straight into the first section of the twin triode.

This of course would wipe the bass and treble controls, so if we were to adopt this course, another type of circuitry would be necessary to replace them, which would not lower the gain. It seemed probable in any case that a high gain triode would be needed to give an acceptable degree of sensitivity.

FEEDBACK

This in fact proved to be true. By feeding the pickup directly into the volume control and using a 12AX7, things looked quite promising.

In order to obtain a sensitivity of about 200 mv, we dropped the feedback down to about 10 db, and further checks indicated that this was about the optimum condition.

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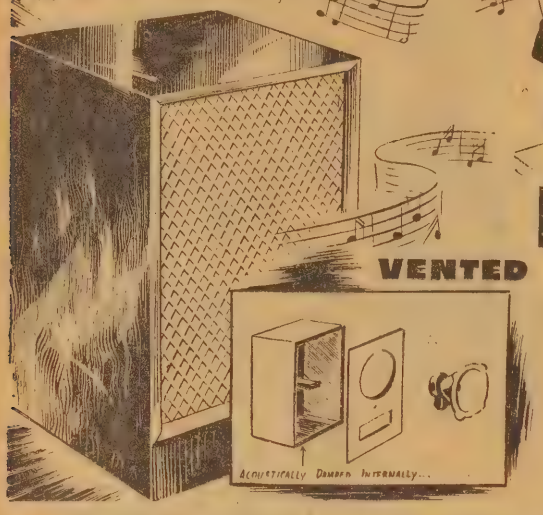

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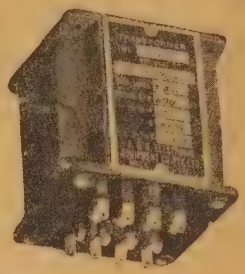

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OUTPUT TRANSFORMERS

* Response Includes Correction due to Negative Feedback ** For use With Rola 12-OX Speaker.

TYPE AND MOUNTING	IMPEDANCE-OHMS PRIMARY	IMPEDANCE-OHMS SECONDARY	FREQ. RESPONSE DB+—	FREQ. RESPONSE CPS	RATING WATTS	TYPICAL APPLICATION	PRICE
894-23	500	2, 3.7, 8, 12.5	2	50-10,000	5	LINE TO VOICE COIL	16/-
900-22	2500 5000	2, 3.7, 8, 12.5, 15	1	*40-15,000	15	SINGLE 807, EL34, ETC, TO VC	57/6
896-9	8000 10,000	2, 3.7, 8, 12.5, 15	1	30-15,000	15	PP6V6G's A OR AB1 TO VC	62/6
879-9	8000 10,000	100, 125, 166, 250, 500	1	30-15,000	15	PP 6V6G's A OR AB1 to LINE	62/6
763-9	3000 5000	2, 3.7, 8, 12.5, 15	1	40-20,000	15	PP 2A3's A OR AB1 TO VC	62/6
809-26	500	2, 3.7, 8, 12.5, 15	1	50-20,000	15	LINE TO VOICE COIL	42/6
870--26	10,000	2 or 8	1	*20-20,000	6**	PP 6V6G's OR 807's AS TRIODES	57/6
871-9	10,000	2 or 8	1	*20-20,000	12	PP 6V6G's OR 807's AS TRIODES	81/-
872-9	10,000	3.7 or 15	1	*20-20,000	12	PP 6V6G's OR 807's AS TRIODES	81/-
891-22	6600	83, 100, 125, 166, 250, 500	1	50-12,000	35	PP 807's AB1 TO LINE	82/6
892-22	3200	50, 62, 83, 125, 250, 500	1	50-12,000	55	PP 807's AB2 TO LINE	97/-

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545-9	SE 4000 TO PP AB2 GRIDS 1.6:1. PRIM. TO ½ SEC RATIO 50-10,000 CPS 5 WATTS	57/6
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The amplifier as it now stood was quite a simple affair with only three valves and a rectifier, a chassis the same as used for the Playmaster Six, and very few circuit components. Its stability was excellent, its frequency response very good, and its output about the 8-watt mark, enough for all average purposes when used with a good speaker. The kind of thing that anyone could put together.

There remained now the matter of the tone controls. The main requirement here was something which did not mean losing out on sensitivity.

In order to analyse this point, considerable work was carried out investigating the performance of various crystal pickups, particularly the Acos, which we know from experience is likely to be used very widely with an amplifier of this type.

The results of some of this work are told elsewhere in the issue by Mr. Williams, who ran off the curves. It was thought that some circuitry associated with the pickup circuit itself would give us the results we wanted, but after experiment we abandoned the idea as being insufficiently flexible and calling for a degree of complexity, which was the very thing we wished to avoid.

It seemed likely also to interfere with any compensation we might wish to use to cater for individual types.

The answer was found in the feedback network.

This is arranged by taking voltage from the "hot" side of the output transformer voice coil circuit and feeding it back into the cathode of the first triode. As not all this voltage was needed, two resistors, one of 7500 ohms (for 150 ohm speaker) in series to the lead from the voice coil, and another of 100 ohms in series with the triode cathode circuit. Assuming the 100 ohms is left constant (and too high a value is not desirable here, varying the value of the 7500 ohms resistor will vary the amount of feedback.

ABOUT 10 DB

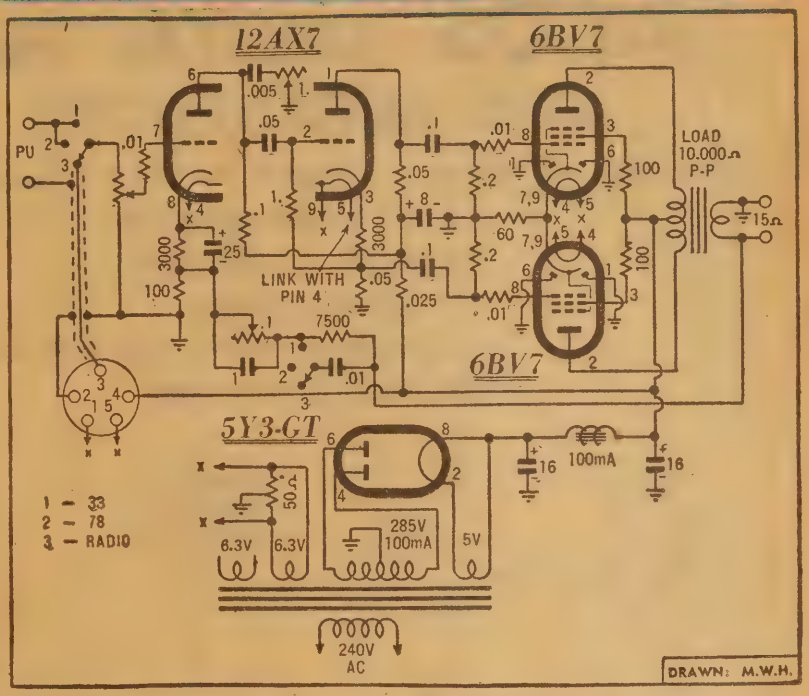
In our case we have arranged for a shade over 10 db. This is enough to make a considerable reduction in distortion, one of the advantages of feedback, and to provide a good degree of loudspeaker damping, another important thing which feedback can do for us. It is not as much as we have used in other amplifiers, but it is enough to give us most of the benefits we get in added measure from larger amounts.

Now the application of feedback means a reduction in overall gain equal to the amount of feedback used. In our case the 10 db of feedback reduces the gain by 10 db.

If we wire a condenser of suitable value in series with the 7500 ohms resistor, we can remove some of this feedback and thus increase the gain at low frequencies. The condenser has an impedance which is also measured in ohms, and as the frequency falls, this impedance rises.

Thus although at, say, 1000 cycles, its impedance added to that of the 7500 ohms resistor makes little difference to the total, at 50 cycles it will make a very large difference, and provide a total impedance considerably greater than 7500 ohms. The net result is less feedback, and an automatic rise in gain as we go lower in the scale.

CIRCUIT DIAGRAM IS SIMPLE



The circuit diagram is extremely simple, one big advantage of this amplifier. Note the socket provided for a tuner if needed. The 100-mill transformer should be adequate for the total drain.

In theory, we could select a condenser whose impedance becomes so large that it removes feedback altogether, and allows us to recover the 10db which we lost at 1000 cycles. And, in practice, this is just what we have done. Our control can give us virtually 10 db boost at 50 cycles as against 1000 cycles.

It is true that removing feedback at the bass end cancels out our reduced distortion, but as this distortion would be apparent farther up the scale in harmonic relationship, there will be an increasing degree of feedback operative at those points (100, 200, 400 cycles, &c.) which will tend to suppress it. And, in any case, it is the reduction of distortion at the higher frequencies which is most valuable, and we have at least 10 db operative there.

In order to give some control over this boosting circuit, we have used a variable resistor in parallel with the condenser which allows its effect to be obtained in full with the resistor "all out" or not at all when "all in". In the circuit the condenser has a value of 0.1 mfds, and the resistor a .1 meg pot. Note than when "all in" it short-circuits the condenser, thus effectively removing it from the circuit.

The treble cut control poses us with two problems. We have two conditions to be provided for when playing microgroove records. We first have to provide a degree of de-emphasis which will bring the treble response substantially flat, and we have secondly to provide a control which will allow us to use an extra amount of variable cut in addition.

There are some records—certain 78's, for instance—which are best played in the "flat" treble position, so ideally we want some means of changing quickly from 78 to LP compensation plus an extra variable control.

For the "78-LP" control we return once more to the feedback circuit.

PARTS LIST

- 1 Chassis 9½ x 7 x 2½in. (Playmaster 6)
- 1 Power transformer 285v at 100 mills 5v and 6.3v filaments
- 1 Filter choke 15H at 100 mills
- 1 Output transformer to suit speaker (10 watt or higher)
- 3 Noval sockets, 1 Octal socket, 1 5-pin socket, 1 speaker socket and plug
- 1 2 hole 3 position switch
- 2 1 Meg potentiometers
- 1 .1 Meg potentiometer

VALVES

12AX7, 2-6BV7, 5Y3-GT

CAPACITORS

- 2 16mfd 525 PV electrolytics, 1 8mfd 525 PV electrolytic.
- 1 25mfd 40 PV electrolytic, 3 .1mfd, 1 .05mfd,
- 1 .01mfd, 1 .005mfd all 350v paper.

RESISTORS

- 1 1 meg, 2 .2 meg, 1 .1 meg, 2 .05 meg, 1 .025 meg,
- 3 .01 meg, 1 7500 ohm, 2 3000 ohm, 3 100 ohm, 1 60 ohm 3 watt, 1 50 ohm CT filament resistor optional.

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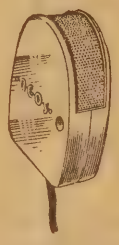

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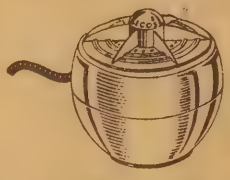

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MIC.3-5	„ „	„ „ „ „ „	12db „ „ „ „	Mervyn	1 19 3
MIC.3-6	„ „	„ „ „ „ „	5db „ „ „ „	Myrtle	1 19 3

MIC. 6 SERIES

TYPE	DESCRIPTION	DIMENSIONS	RESPONSE	CODE	PRICE
MIC.6-4	General Purpose	2 1-32in dia. x 19-32 thick	20db Peak at 2250 C.P.S.	Margie	£1 19 3
MIC.6-6	„ „	„ „ „ „ „	5db „ „ „ „	Maudie	1 19 3
MIC.6-11	„ „	„ „ „ „ „	12db „ „ „ „	Mandy	1 19 3

MIC. 14 SERIES

TYPE	DESCRIPTION	DIMENSIONS	RESPONSE	CODE	PRICE
MIC.14-5	General Purpose	1 7-16in dia. x 11-32in thick	20db Peak at 3500 C.P.S.	Maxie	£1 19 6
MIC.14-11	„ „	„ „ „ „ „	12db „ „ „ „	Mitchell	1 19 6
MIC.14-12	„ „	„ „ „ „ „	5db „ „ „ „	Malcolm	1 19 6
MIC.15	Hearing Aid	0.9in dia. x 0.155in thick	30db „ „ 3000 „	Marlene	1 19 6
MIC.17	„ „	15-16 in sq. x 7-32in thick	30db „ „ 3500 „	Maggie	1 19 6
MIC.18	General Purpose	1 7-16 in dia. x 9-32in thick	20db „ „ „ „	Maisie	1 19 6

MIC. 23 SERIES

TYPE	DESCRIPTION	DIMENSIONS	RESPONSE	CODE	PRICE
MIC.23	General Purpose	1 3-16 sq. x ¼in thick	20db Peak at 3000 C.P.S.	Maureen	£1 19 3
MIC.23-3	„ „	„ „ „ „ „	5db „ „ „ „	Margaret	1 19 3
MIC.23-4	„ „	„ „ „ „ „	12db „ „ „ „	Milton	1 19 3
MIC.32	High Quality	1 13-16 dia. x 9-16in thick		Martin	2 15 6

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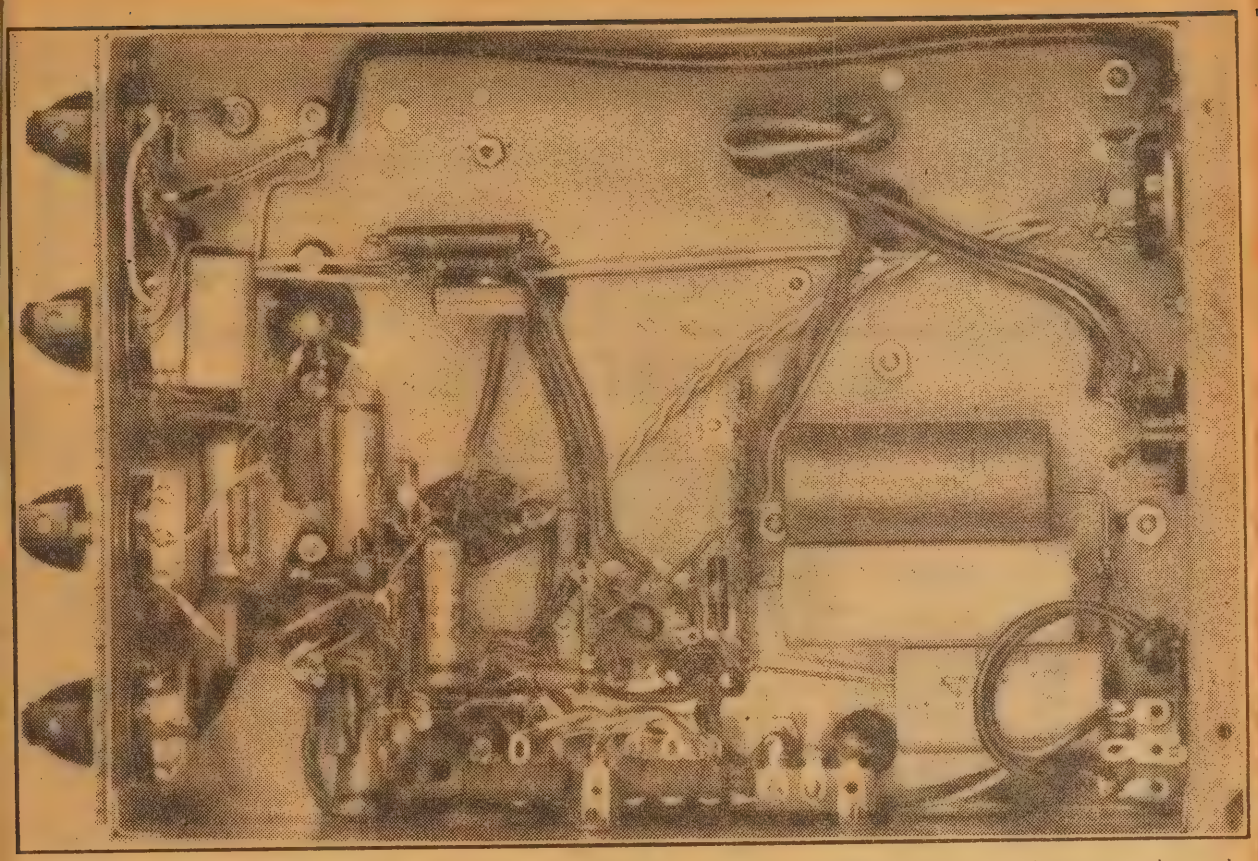

Most of the small components can be supported wholly or in p art on a long tag strip mounted between the output sockets and the 12AX7. Many constructional features can be seen here.

Now we have already made the point that overall gain is reduced as the feedback is increased. We also know that condensers have an impedance measured in ohms which increases with frequency.

If therefore we arrange to switch a condenser in parallel with the 7500 ohms feedback resistor so that its impedance does not affect this value much at 1000 cycles but lowers it at, say, 10,000 cycles, we will get more feedback at the latter frequency, reduced amplifier gain, and, in effect, treble cut which increases with frequency.

This, of course, is what we want, and is due to the fact that when we connect two resistances or impedances in parallel, the total value is less than either of them.

TYPICAL FIGURES

At 1000 cycles the .01 condenser has a value of 15,900 ohms, but at 10,000 cycles it is reduced to 1590 ohms. Such a value increases feedback and reduces gain at 10,000 cycles by about 10 db.

We have used the function switch to do all this. One position provides no top cut for 78's, the second is the LP position, and the third switches the input circuit to a socket into which any Playmaster tuner may be plugged.

We still have our extra variable top-cut control to provide for. This is done by a simple top-cut circuit at the plate of the first triode section, where it bypasses high frequencies to ground. This is quite a standard procedure, but it is interesting to note that it it still the varying impedance of the condenser with frequency which provides the reduction.

For the purposes of record, we publish herewith a graph showing the performance of the amplifier in all positions, including the amount of bass boost and treble cut obtainable from the controls.

How does the performance of the finished amplifier compare with last month's Playmaster, for instance?

Well, it does not provide the accuracy of playback curves which are demanded by the highest standards, but then it did not set out to do that. But this does not mean that it doesn't sound good, because it really does. It means that the playback characteristics are approximated rather than measured, but its flexibility is quite sufficient to make any record sound well.

It will, in fact, do very much with a crystal pickup what the Playmaster Six did with other pickups, and, judging by the popularity of the Six, that's good enough for quite discriminating ears.

Naturally the quality of your pickup will have a big bearing on the results, and the better the quality of the pickup, the smoother the amplifier will sound. It is good enough to merit the highest class of speaker if you can run to it, and would be a very nice set-up with a 120X if your ideas on prices are more modest. The 120X, having a voice coil impedance of 2.3 ohms, will need a different set of values which are given elsewhere.

The circuit is an extremely simple affair. The first half of the 12AX7 is a resistance coupled amplifier to which feedback is applied from the voice coil.

Note that there is a suppressor resistor in series with the grid of this section which should be mounted right at the grid and can in fact be used to connect it with the moving arm of the potentiometer.

This resistor was found necessary to avoid the danger of motorboating when the gain control is turned to zero and which is doubtless caused by the effect of phase rotation in the feedback network as the result of our use of it for tone control. The suppressor completely removed any such tendency to motorboat. It will be remembered that with the original Williamson amplifier for instance, this resistor was often required for the same reason. There need be no qualms about its presence, and its value isn't particularly critical. It simply ensures that at all times there will be some resistance between the grid of the valve and earth.

The second section of the 12AX7 is a conventional phase-changer which feeds the output valves. The coupling condenser of .05 mfds, incidentally, could be much lower than this in value, as the effective grid impedance of the phase-changer is extremely high. It could be reduced to .01 or even lower without unduly affecting bass response.

HIGH SLOPE

The 6BV7's are extremely high-slope valves, and it is the most desirable to include the suppressors as shown in the circuit. Without them there is a good chance of parasitics starting up which will completely ruin performance. Note once more that they are connected right at the socket pins of the valves.

The underchassis picture shows a fairly tight grouping of components between the output valves and the 12AX7 but in fact it isn't so bad. We mount a long terminal tag strip

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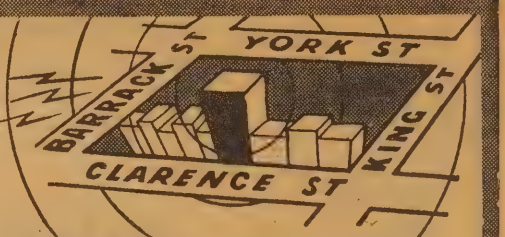

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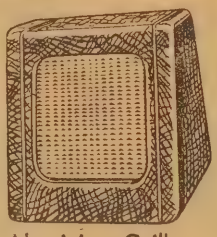

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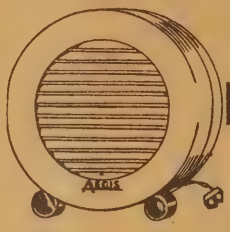

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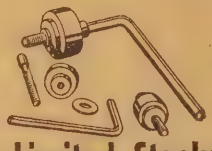

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between the sockets, and using half-watt resistors managed to support them all quite nicely in a kind of bridge work. By this method many resistors can run straight from the socket pins to the tag strip, making a very compact layout.

Note, too, that the electroytics are mounted well out of the way on another tag strip, to which the leads from the choke can be fastened. The unused socket pins on the rectifier socket can also be used as tie-points.

The two wire-wound resistors at the side of the chassis are a 50 and a 10 ohm wired in series to make up 60 ohms, the bias resistor for the 6BV7's.

EXTRA SOCKET

As we built this amplifier from the original Playmaster Six, there is one Noval socket too many mounted on it in which the EF86 was originally housed.

Just near this socket are the feedback resistor and its condenser. These should be mounted out of the way, and kept well apart from input leads.

The filament windings of the transformer will probably have one at least centre-tapped, and this can be connected to the chassis to earth the filament line. The centre-tapped resistor mentioned in the parts list will only be needed should there be no centre-tap.

The chassis picture shows the output transformer mounted squarely on the chassis, but before being mounted in place, you should test for hum pick-up from the power transformer. Initial work on the amplifier was completed before we took it home for a final check, and it's not possible to test for extremely low hum levels in a noisy office.

HUM TEST

To check for this hum, connect the mains to the power transformer, and with the speaker voice coil circuit connected to the output transformer, rotate it with your ear close to the speaker, until you hear the last vestige of hum cancel out. It might end up with a 45 degree angle, but there is plenty of room to mount it in any position. The valves should not be in the amplifier—any of them —while this check is being made.

When the job is finally built, and the gain control turned to zero to obviate any danger of pickup from the input leads, the amplifier should be completely humless, and no sound heard from the speaker further than a foot or so away.

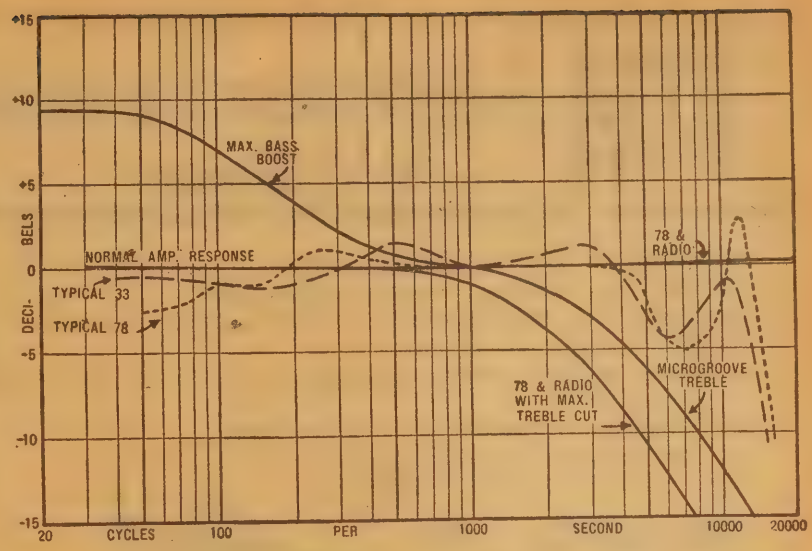
The tuner socket is wired correctly for use with any of the Playmaster tuners which can be used merely by plugging in if you wish to turn the job into a radiogram.

There is no reason why the amplifier should not be built on a different size and shape of chassis if required, although the Playmaster Six chassis is quite small and convenient.

If the amplifier is to be used with speakers with other than a 15-ohm voice coil, the output transformer will need to be purchased to suit and changes made in the feedback network.

Thus the 7500-ohm resistor will reduce to 5000 ohms for an 8-ohm voice coil and to 2500 ohms for a 2-ohm voice coil. The 0.1 mfd. bass boost capacitor will increase respectively to 0.15 and 0.3 mfd., while the treble de-emphasis capacitor will rise respectively from .01 to 0.15 and .03 mfd.

These values will have to be made up by connecting standard capacitors in parallel.



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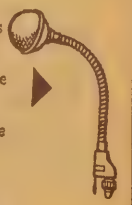

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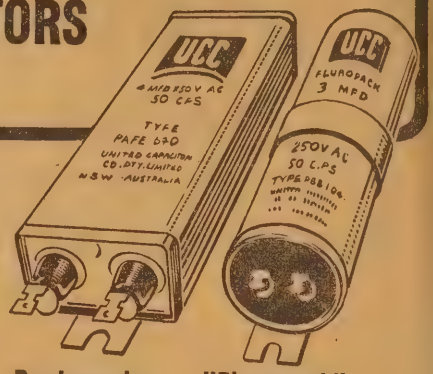

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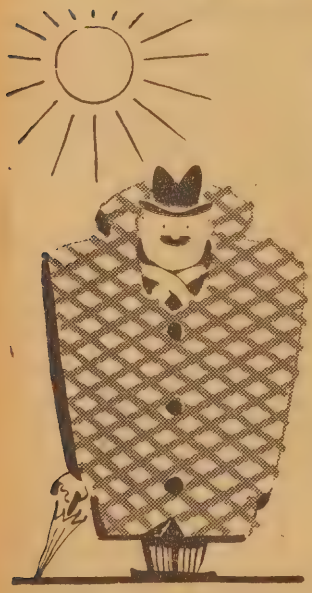

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PART 51—THE NTSC COLOR SYSTEM—(cont.)

In our last issue, we described the process by which color signals could be modulated on to a sub-carrier for subsequent application to the main station carrier. It now remains to see how this basic principle is used in what is now accepted as the standard NTSC type of transmitter.

IT will be recalled that the discussion to date has been based on last month's much-simplified figure 3, which assumes that signals describing all three primary colors are impressed on the sub-carrier.

In its final form, the NTSC system envisages eliminating from the transmission the direct signal corresponding to one complete color channel. The information is not sacrificed in the process, however, the full 3-color system being retained.

This is possible because of a simple algebraic truth.

SIMPLE ALGEBRA

In the expression 1 plus 2 plus 3 equals 6, it is entirely possible to eliminate one of the figures without creating any mystery.

If it were written 1 plus X plus 3 equals 6, it would be a simple matter to deduce that the figure "X" could only be 2.

In an exactly similar fashion, the system envisaged by last month's figure 3 provides for the transmission of three separate color signals plus their sum — the total brightness signal. Obviously one piece of information can be omitted, without rendering the signal ambiguous.

In practice, the green signal can most conveniently be omitted, leaving the final radiated signal to contain relevant information about total brightness, red content and blue content. Additionally, of course, there will be the necessary synchronising pulses &c., as with any TV transmission.

The receiver utilises the synchronising pulses in the normal way and, from the content of the main video signal, electrically "estimates" the green information.

SAME OPERATION

Broadly speaking, it does this by solving the same kind of formula as in the simple illustration given earlier. If the signals corresponding to the blue and red components are subtracted from the total brightness signal, what is left can only be accounted for by the suppressed green component.

In other words, the receiver operates on the principle that any brightness, other than that indicated for red and blue, must represent green. This point will be covered in greater detail later but it is sufficient to emphasise that the fundamental 3-color system is retained.

Figure 5 represents a complete NTSC pattern transmitter in essential block schematic form. Apart from the elimination of the green sub-modulator, as already described, it contains a certain amount of extra detail.

As before, the scene is analysed through filters which separate the red, green and blue images and impress them on the screens of three separate picture tubes.

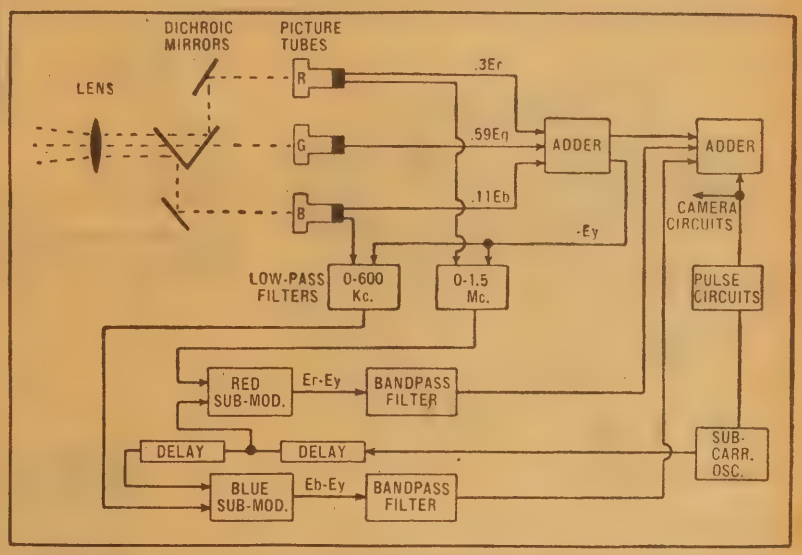

Figure 5: This block schematic can be compared with last month's figure 3. It indicates the essential features of a transmitter based on current NTSC principles. "Green" information is not radiated directly although, from the figures shown, it obviously makes the largest contribution to the brightness and therefore the monochrome pattern.

The output from each of these is then combined in carefully selected proportions to produce a total brightness signal, shown as "Ey". This constitutes the video signal required by monochrome receivers and also provides the essential brightness information for color receivers.

A proportion of the output from the red and blue tubes only is also taken through low-pass filters, as described last month and applied to the respective sub-modulators.

At this point, the color signals are first combined with an out-of-phase brightness component (shown as "-Ey") and then modulated on to signals from the sub-carrier oscillator, each delayed in phase by a predetermined amount.

The ultimate output from each sub-modulator is then described as a "color-difference" signal, which indicates hue (or color) by reason of its phase, relative to the sub-carrier oscillator, and saturation by reason of its amplitude.

The output from the sub-modulators passes through a band-pass filter system and thence into the main modulator circuit.

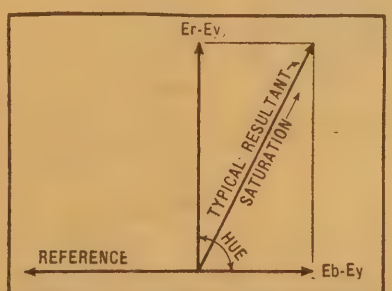

Figure 6. A more accurate representation of the color vector principle, as applied to the NTSC system. The proportions of red and blue, and the degree of saturation for each is described by the length and angle of the vector.

VECTOR DIAGRAM

All this becomes virtually a restatement of last month's discussion around figure 3. The essential difference is that the green color difference signal is eliminated as a direct quantity, though it is still recoverable at the receiver by a process of addition and subtraction.

The ultimate output of the NTSC pattern transmitter therefore contains brightness information (to which green is the main contributor) red and blue color difference signals and information on synch. pulses and sub-carrier phase.

Considering for a moment the matter of sub-carrier phase, last month's sketch of a vector operat-

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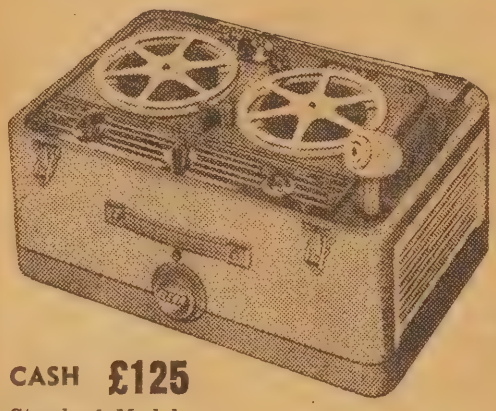

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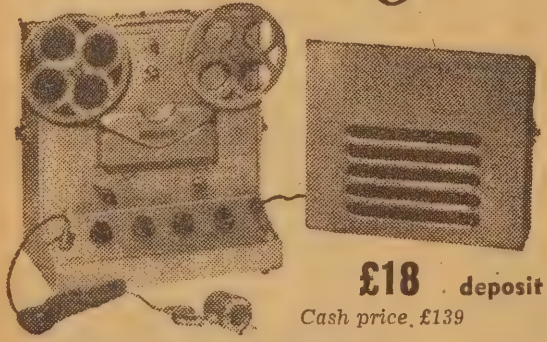

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ing inside a color triangle can now be reduced to a simpler and more rigorous form.

Referring to figure 6, the phase of the sub-carrier oscillator may be represented as a vector quantity pointing to the left and designated "Reference".

The delay line feeding the red sub-modulator may be envisaged as displacing the phase by a full 90 degrees, with a further 90-degree displacement to the blue sub-modulator. These vectors, equivalent to color difference signals, are therefore marked "Er-Ey" and "Eb-Ey".

For a purely blue picture area, equivalent to the filter color, the sub-carrer phase would differ from reference by exactly 180 degrees. Similarly, a purely red picture area would produce a sub-carrier displaced by 90 degrees.

For tones between blue and red, where there is a component of each present, the sub-carrier signal as radiated, would have a resultant and intermediate phase angle, as represented by the oblique vector.

The receiver accepts this resultant and translates it back into appropriate proportions of red and blue, ultimately to activate the respective "guns" and phosphors.

GREEN SIGNAL

It also subtracts the red and blue energies from the total brightness signal and applies the result, through appropriate networks, to activate the "green" gun in the reproducing tube.

By this means, a particular area in the final picture can be diluted by the green gun, from the saturated red-to-blue regions to pastel shades and then to white. As the proportions continue to change, the green gun may begin to predominate, producing a pastel green and deepening to saturated green as the red and blue guns are cut off.

Figure 7 shows how the complete color picture signal fits into the allotted 6 Mc channel, assuming US standards.

The picture carrier is located, as is usual, 1.25 Mc above the lower limit of the band. Filters are used to taper the lower sideband beyond about 0.75 Mc. The upper sideband is allowed to extend to about 4.5 Mc, being rapidly attenuated thereafter to leave a clear channel for the FM sound carrier.

As already mentioned, color or the "chrominance" signal is centred around a frequency higher than the signal frequency by 3.579545 Mc. The blue content sidebands occupy a relatively narrow area close to this figure, but the red content sidebands transgress more deeply into the regions close to the picture carrier.

Interference between brightness and chrominance sidebands is minimised by so relating the carrier frequencies that the respective clusters of sideband energy tend to alternate or interleave in terms of frequency placement.

SIDEBANDS

The same filters, which limit the spread of the brightness signal, also suppress some of the color sideband energy, particularly for the more detailed red signals. This can be allowed for, however.

Perhaps the most outstanding point which remains is that the receiver's ability to sense hue depends entirely on a small displacement in phase of a high frequency sub-carrier. The transmitted signal must therefore contain some clue as to the phase of the original chrominance carrier, so that deviations from it can be properly interpreted.

Since the reference carrier cannot be accommodated in the regular video signal, a short burst of the carrier is included at the end of each line, along with the horizontal synchronising pulse.

From earlier discussion in this television series, it will be recalled that, with negative modulation, the synch. pulses produce maximum carrier amplitude and extend into the "blacker than black" region.

In other words, in a typical amplitude diagram like figure 8, black corresponds to the "blanking" or "pedestal" level, the synch. pulses extending beyond it.

At the end of each line, the synch. pulse does not immediately follow the picture signal. Rather does the carrier amplitude return momentarily to the pedestal or blanking level, immediately before the pulse is radiated. After the pulse, the amplitude lingers for a moment at pedestal level, before beginning the next line signal.

This gives rise to the rather peculiar expressions of "front porch" and "back porch", as indicated in figure 8.

It so happens that there is just space on the "back porch" to accommodate a brief burst of the chrominance carrier at reference phase. In point of fact, it amounts only to about 8 cycles at 3.58 (approx.) Mc but this is fortunately enough to synchronise a companion oscillator in the receiver.

Since the color burst occurs on the "back porch", it does not affect normal synchronising circuits, operated by the leading edge of the regular synch. pulse.

Furthermore, even though the color burst amplitude reaches down to the grey region of the video signal, it is of such brief duration that, superimposed on the flyback, it is not normally visible.

This, however, has to do with the operation of color receivers, which will be pursued in greater detail next month.

(To be continued)

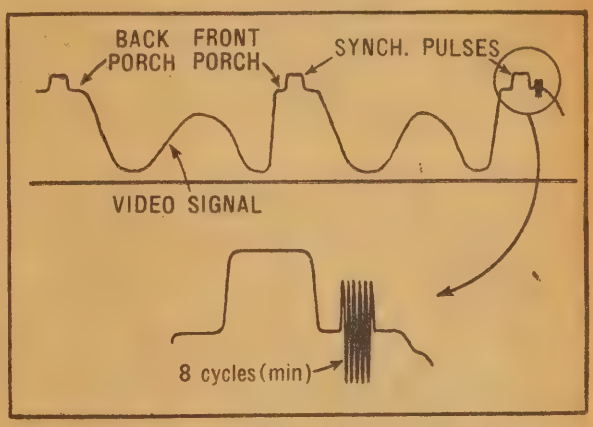

Figure 8: Showing a segment of a typical video signal and (inset) how the color burst is accommodated on the "back porch".

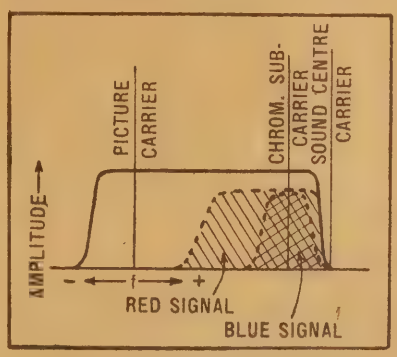

Figure 7: Illustrating graphically how the signals from a standard NTSC pattern transmitter are disposed in the allotted 6Mc band. Note that the higher color sidebands suffer some attenuation.

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Here's your answer, Tom!

On these pages we make a feature of answering readers' queries in more detail than would be possible in the usual Answers to Correspondents section. We pick out questions which are likely to be of interest to a large number of readers. Sometimes they are questions which seem a little naive but which on closer inspection have quite a lot to them.

ALTHOUGH we can't say definitely that your answer will be published in the following terms, we would be glad to hear from readers who have any queries that they think would be suitable.

As far as the answer is concerned, everyone enters into the character of our now famous "Tom", so that your name will not be published. Address your letters to the Technical Editor, Radio and Hobbies, Box 2728, GPO, Sydney. Even if we cannot use your question, your letter will be acknowledged.

Tom's first query this month is an

example of what may appear to some a silly question, but which brings up many interesting points about power distribution.

Is there any effective way of curing the 50-cycle AC hum from powerhouse generators? If there is, why don't they prevent the hum at the machines themselves?

If we wanted to be facetious, Tom, we could suggest that people living close to powerhouses are worried even more by the hum than you are — particularly if they don't like the smell of coal and oil smoke. But, that's probably not the kind of "hum" you have in mind!

Yes, Tom, there is a very effective way of curing AC hum. Use direct current generators instead of alternators.

SPECIAL ADVANTAGES

The key to the whole situation is that there are some very special advantages in generating power in the form of alternating current (i.e., current which alternates its direction periodically) rather than direct current. Except for certain special cases, nearly all power is generated as alternating current these days.

The main advantage of alternating current is the ease with which it can be transformed to different voltages. Why, you ask, is it desirable to change the voltage?

Perhaps, if we could get hold of an electrical engineer from a power-station, he could give you a better answer, but we will do our best. He would tell you that it is convenient to generate the power at a relatively low voltage because of insulation problems in the generators and the need for switching in the power-station itself.

On the other hand, it is not convenient to transmit the power over long distances at this voltage because, in order to prevent excessive voltage drop, the wires have to be very thick. Therefore, the output of the generators is applied to transformers which step it up to a very high voltage. For long lines between communities, voltages as high as 33,000 are not uncommon.

At 33,000 volts, a large amount of power can be transmitted with little loss over great distances without using extremely thick wires.

Naturally, special precautions have to be taken when handling such high voltages. The wires are usually supported on high steel towers and the insulators have to be quite elaborate to withstand the voltage under all weather conditions.

However, carefully worked-out cost figures indicate that it is cheaper to provide the special towers and insulators than the thick conductors which would be necessary to transmit power at low voltages with reasonably low loss.

STEP-DOWN

Transformers are used again at the consumer end to step the voltage down to some convenient value. Obviously, it would be quite impractical to run domestic machines from a 33,000 volt supply. Imagine the wires coming into Mum's washing-machine supported by insulators 6ft long!

There aren't many commercial undertakings, either, which could conveniently use power at voltages higher than the usual 415 volt 3-phase or 240 volt single-phase.

These transformers consist essentially of an iron core with windings of copper wire around it. At the power-station, one winding is connected to the generator and the other winding, consisting of a larger number of turns, connects to the transmission line. At the other end of the line a reverse transformation takes place.

Power transformers are reliable, and require very little maintenance in service. It is possible to design them so that very little power is wasted.

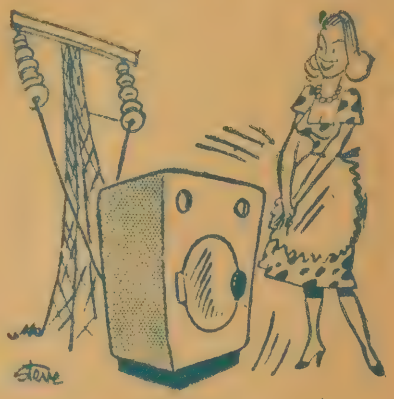
However, they will only work with alternating current.

If you design your generators to supply direct current, it would still be possible to change it to a higher voltage for transmission, but to do this you would need in effect a motor designed to operate from the original generator driving another generator operating at line voltage. This would be very silly, since the main reason for using a transformer at the power-station end is the difficulty of generating power at a high voltage.

DIRECT CURRENT

Even if you used a motor-generator set at the consumer end, such a set would cost much more than a transformer designed to handle the same power, be more expensive to maintain and at the same time be less efficient.

Direct current is often used for heavy traction systems where it is desired that the motors be as compact as possible, but, in such cases, the rails are usually used as a return



connection, and the problem of supplying a single heavy conductor parallel to the rails is quite different from that of a long-distance transmission line.

Coming back to ordinary radio receivers, it is true that it is necessary to provide a power-transformer and filter in order to convert the alternating current to smooth direct current for the plates of the valves. However, radio receivers are only relatively minor power consumers, and therefore deserve little consideration in the overall scheme of things.

Just the same, the filter circuits

are comparatively simple and inexpensive. Even with a DC system, some form of filter is necessary in order to remove line surges and ripple.

Power-transformers cost little and give practically no trouble in service. They allow the receiver proper to be completely isolated from the mains and windings can easily be added to provide exactly the required voltages for the filament and plate circuits of valves.

No, Tom, there is no worthwhile argument in favor of DC for domestic power.

* * *

About 1925, it was possible to pick up America on the broadcast band on as little as two valves. Nowadays, with a much improved type of set, it is hard to get much farther than a neighboring State. I would like to know if charts for predicting conditions are available, and where they can be obtained.

There are several good reasons why the state of affairs you describe exists. As you know, propagation conditions over long distances vary greatly from time to time. The times when broadcast signals from America could reach Australia at reasonable strength may only be a small proportion of the total 24 hours.

AERIAL SYSTEMS

Nowadays, most of that 24 hours, signals from thousands of stations not only in Australia but in New Zealand, India and Eastern countries, are pouring energy into the frequency bands occupied by the American stations. Therefore, at the times when you are most likely to hear them they are probably right under a strong local.

Of equal significance is the fact that broadcast engineers nowadays design their aerial systems in such a way that most of the energy is concentrated to give a strong signal in the vicinity of the transmitter at the expense of weaker signals at greater distances. No longer is the engineer proud of the fact that his station is heard half-way around the world. In fact, it indicates a definite weakness in the aerial design!

He has come to realise that local listeners and local sponsors pay his salary and his job is to give them the best service possible. This is in contrast with his counterpart years ago, who was proud of his station's ability to span great distances.

On the receiving end, listeners of years ago thought nothing of erecting a couple of 50ft poles 60ft or so apart, to support an aerial. The aerial could be tightly coupled to the input coil so that a maximum transfer of energy took place. The lack of selectivity was not so important because there were so few stations in operation.

PREDICTION CHARTS

Most modern receivers are very sensitive, and, because of easy availability of highly developed components, it is little more expensive for them to be made this way. A piece of wire strung around the picture rail works perfectly, and few, other than people interested in radio, go to the trouble of preparing anything more elaborate.

That should serve to assure you, Tom, that the radio art is not deteriorating, but your other specific query yet remains to be answered.

There is an Ionospheric Prediction Service which is part of the Commonwealth Department of the Interior. The Service can supply information of the type you have in mind. However, the difficulty is that much of the information presupposes a wide knowledge of radio and unless you are experienced in these matters you may have a great deal of difficulty in extracting the particular information you require.

A comforting thought is that there are still plenty of listeners who manage to log overseas stations on the broadcast band through the blanket of locals, so if you are interested in this type of work, it is well worth trying.

★ ★ ★

I have noticed advertisements in Radio and Hobbies for electrolytic capacitors. Could you tell me how these differ from ordinary capacitors and also what do the plus and minus signs mean?

Most capacitors are, in essential, made up of two metal plates separated by an insulating material which is referred to as the dielectric. Special types of paper and mica are frequently used as dielectrics for fixed capacitors, and you are no doubt familiar with ordinary tuning capacitors which use air as a dielectric.

Electrolytic capacitors have one of the plates made of aluminium and the other "plate" is a semi-liquid material which is a conductor of electricity.

When direct current is passed between the plates, an extremely thin layer of insulating material forms on the surface of the aluminium. This insulating material does the same job as the paper, mica or air dielectric of other types of capacitors.

The important point is that the thickness of the dielectric material is very much less than would be practicable with any dielectric formed by mechanical means. As the capacitance is inversely proportional to the thickness of the dielectric, this means that it is possible to make a capacitor of a given value very much smaller than would otherwise be possible.

VOLTAGES

The voltage which electrolytic capacitors can withstand is proportional to the thickness of the dielectric so that high voltage types must have a larger plate area for a given capacitance. The thickness of the dielectric is determined during the manufacturing process.

For the capacitor to function correctly, the aluminium plate must be connected to the positive side of the circuit. If the connections are reversed the leakage current will be high and the capacitor will destroy itself in a short period. It is particularly important, then, to observe the polarities indicated by the manufacturer.

In practice, it is difficult to make connection to a semi-liquid conductor, and a second aluminium foil is often used to achieve a good connection. However, this second foil is not the true negative plate. It only makes connection [illegible].

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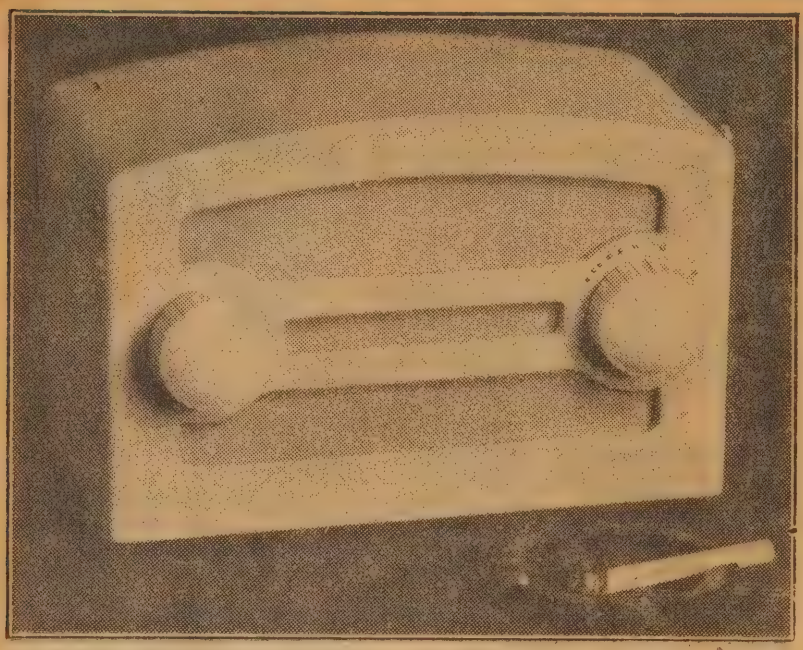


We used little pins to mark the positions of the stations, reckoning that it wouldn't be hard to remember them. If you are an artist, you could paint the signs on a celluloid circle a little larger in diameter than the knob. Another circle could be made for the volume control.

Here is a view of the new receiver housed in its cabinet. The white knobs and the beige material behind the speaker grille contrast nicely with the light green shade of the cabinet.

NEW! THE MANTEL MINOR

Here is a brand new little set which will catch both your eye and your ear. It may be small in size but it packs quite a punch — truly a mighty midget. Designed as a cheap, easy-to-build mantel set, it employs four valves and operates from 1 to 2 feet of aerial.

by Raymond Howe

FOR many years now we have been describing sets in this magazine—small sets, large sets, simple and complex ones, each designed specifically to meet the needs of readers in some way or other.

In certain cases, we have aimed at a design, which presented the desired result in the cheapest manner possible, remembering that cost is quite an important feature to many home constructors.

By necessity, designs have to be centred around commercially-available components and this places some restriction on fancy ideas or sets of a special nature.

True enough, the innovation over the last few years of miniature components has allowed a considerable reduction in the physical size of sets, but, unfortunately, this has not applied to the total cost.

SIMPLICITY

On this score, the only other method of attack is to produce a design which is stripped to the limit of "unnecessary" components without seriously jeopardising the overall performance.

This method of attack tends to go hand in hand with simplicity of construction and, in this, you have the background to the design of our new mantel to be described here.

This set is intended to give the most in a mantel set for the least financial outlay, and to be sufficiently simple for a near beginner to build successfully.

At the outset, we dispensed with a dial on the assumption that direct tuning drive with a large knob running against "spot" markings on the cabinet is quite satisfactory for tuning local stations. In many cases, the average listener is familiar with the order of local stations as they "appear" around the dial. For those who are not, it takes little time to get to know the "lay" of the stations.

On the electrical side, we grouped voltage feeds into two common points and arranged it so that we could omit the filter choke from the power supply. To the average person, the residual hum level doesn't exist, or is so low as not to be noticeable.

You will note that there is no standing bias provided for the first two valves. Actually, when not tuned to a station, they obtain optimum bias due to the high resistance in the DC grid return and development of AVC voltage from "background" noise and contact potential in the diode.

The space is too limited to go into great detail with the circuit design. However, as a guide for readers in checking the finished product, here is the order of the voltage readings you can expect to observe with a multimeter.

VOLTAGES

At "no signal" conditions, that is, with the aerial lead shorted to the chassis, the voltage at the common point feeding the oscillator B-plus and the 6AE8 and 6BA6 screens will be about 85 volts, and that at the common point feeding the anodes of both of these valves and the screen of the 6BV7 will be just under 200 volts.

When tuned to a station, these voltages will rise to approximately 125 volts and 215 volts respectively. Under the same conditions, the back-bias voltage will vary from 4.8 volts to about 4.6 volts. The HT voltage is around the 240-volt mark.

The constructional side of the set forms the greater part of this story as we want to favor those readers who are just beginning to gain experience in set construction.

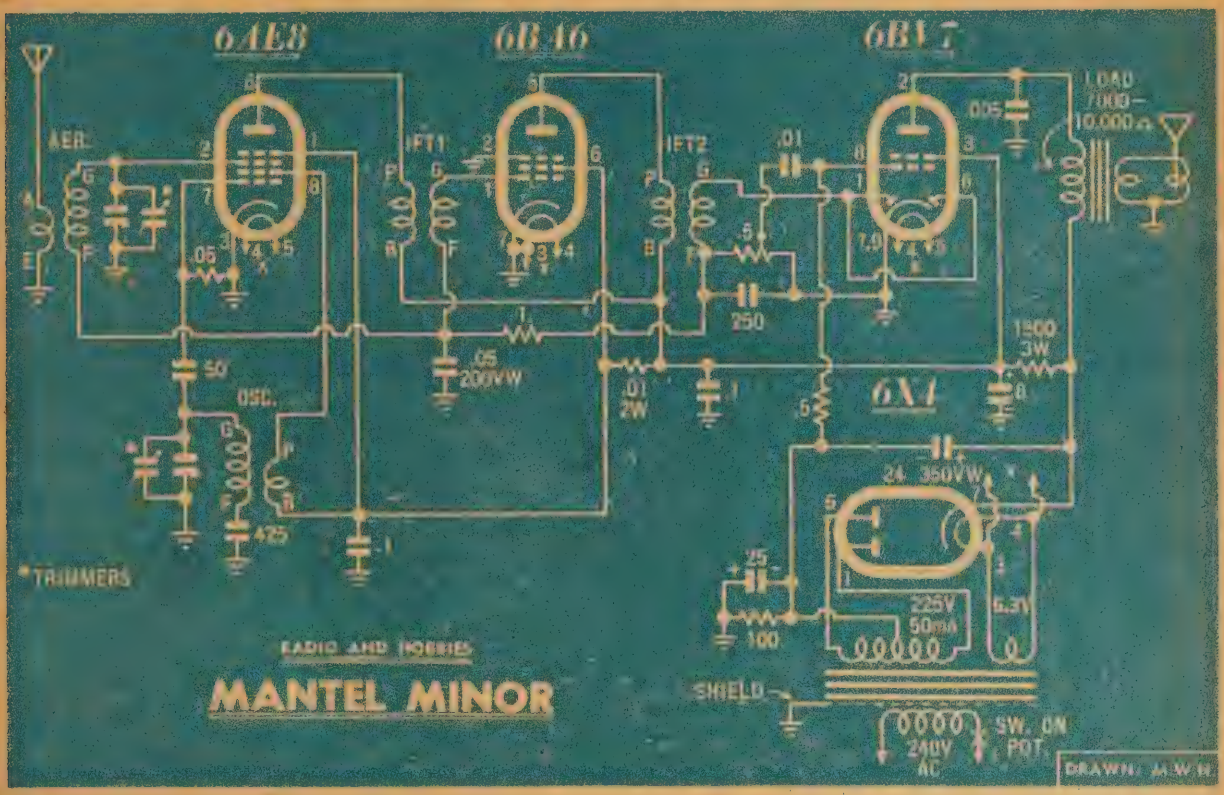
CHASSIS DESIGN

Unfortunately, we had to have another chassis design. With small mantel sets it is extremely difficult to adopt an existing chassis to a new circuit design. We make every attempt to do so with very set we describe, for obvious reasons, but there is a limit to which such chassis versatility can be taken.

This chassis measures 7 7-8in by 4in by 1¼ in deep. The volume control is mounted on a portion of the chassis at the left which is turned up to form a bracket. The speaker is mounted in the usual fashion in a cutout inside the front edge of the chassis.

Some readers may purchase a ready-made chassis, others may elect

SIMPLE CIRCUIT DIAGRAM NEEDS FEW PARTS



Simplicity is the keynote behind the design of this circuit. High tension feeds are arranged in two groups at which the voltages to be expected are given in the text. Watch the polarity of the three electrolytic capacitors when wiring them into circuit. The red end is positive.

to make up their own. If you follow the latter course, we suggest that you use aluminium as it is easy to work. We use this material to make up the chassis for many of our prototype models for this very reason.

When it comes to assembling the set, you will be able to locate the position of each of the major components with the aid of the photographs and the underchassis wiring diagram. Commence by mounting the valve sockets, bearing in mind that it makes for easier wiring and fitting of the minor components if the sockets are orientated in a particular way.

The lay of a socket is given by the relative position of the gap between the first and last pins. Incidentally, the pins are considered as being numbered in a clockwise direction commencing from the gap. With the moulded type of socket we have used, the position of this gap is marked on the underchassis wiring diagram.

ASSEMBLING

As a further guide, the gap of each socket is as follows: 6AE8 and 6BA6, toward the nearest side. 6BV7, toward the same side, 6X4, toward the 6BV7 socket.

Place a solder lug under the nut of the securing bolt near the gap in the pins.

As the next step, we suggest mounting the tuning gang, the coils and the intermediate frequency transformers. See that you do not get the aerial and oscillator coils mixed. The aerial coil is the one nearer the speaker position. When mounting the coils, mark the identification letter or number of each pin on the underside of the chassis because it is obscured once the component is in place.

The IF transformers, too, have their specific positions. They are usually numbered 1 and 2. The No. 1 follows the 6AE8. As with the coils, mark the pin identification on the underside of the chassis as they go into place.

In common with the valve sockets, the coils and IF transformers should be orientated as indicated in the wiring diagram.

The volume control must be mounted before the power transformer is fitted. Position the control so that the lugs are toward the speaker cut-out, through which the leads to it will pass.

The volume control and the tuning gang should be positioned so that the shaft in each case is 7-8in in from the side of the chassis. Note that the gang carries a ¼in extension shaft. Place solder lugs under the nuts of the two outside securing bolts of the tuning gang.

The power transformer could be

PARTS LIST

1 chassis 7⅞in by 4in by 1½in.
1 cabinet to suit (see text for details).
1 power transformer 225V a side 50 mA, 6.3V 2A.
1 miniature 2-section tuning capacitor (direct drive, preferably Philips).
2 gang trimming capacitors.
1 miniature aerial and oscillator coils (broadcast).
2 miniature 455 Kc IF transformers, Nos. 1 & 2.
1 5in speaker with transformer in range 7000 ohms to 10,000 ohms.
2 9-pin and 2 7-pin miniature valve sockets.

RESISTORS

1 meg (½w, 1 .5 meg potentiometer with single pole switch, 1 .5 meg ½w, 1 .05 meg ½w, 1 .01 meg 2w, 1 1500 ohm 3w, wirewound, 1 100 ohm ½w.

VALVES

1 6AE8, 1 6BA6, 1 6BV7, 1 6X4.

CAPACITORS

1 25 mfd 40PV, 1 24 mfd 350PV and 1 8 mfd 525PV electrolytics, 2 .1 mfd. 1 .05 mfd 200VW, 1 .01 mfd, 1 .005 mfd (all tubulars are miniature type), 1 425 pf (low tolerance), 1 250 pf, 1 50 pf.

SUNDRIES

2 large white knobs, 1 7-tag mounting strip, 3 rubber grommets ⅜in i.d., 1 ¼in extension shaft, power flex and plug, nuts, bolts, solder lugs, solder, hook-up wire, spaghetti sleeving, materials for cabinet.

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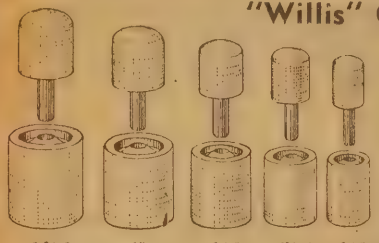

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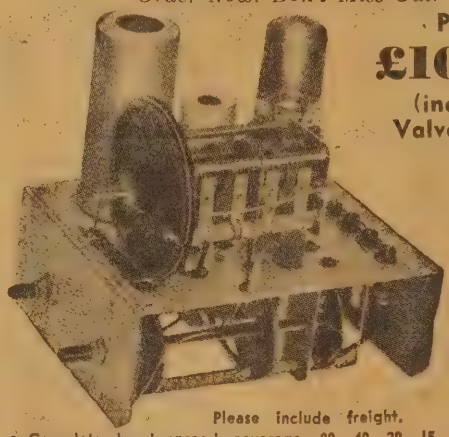

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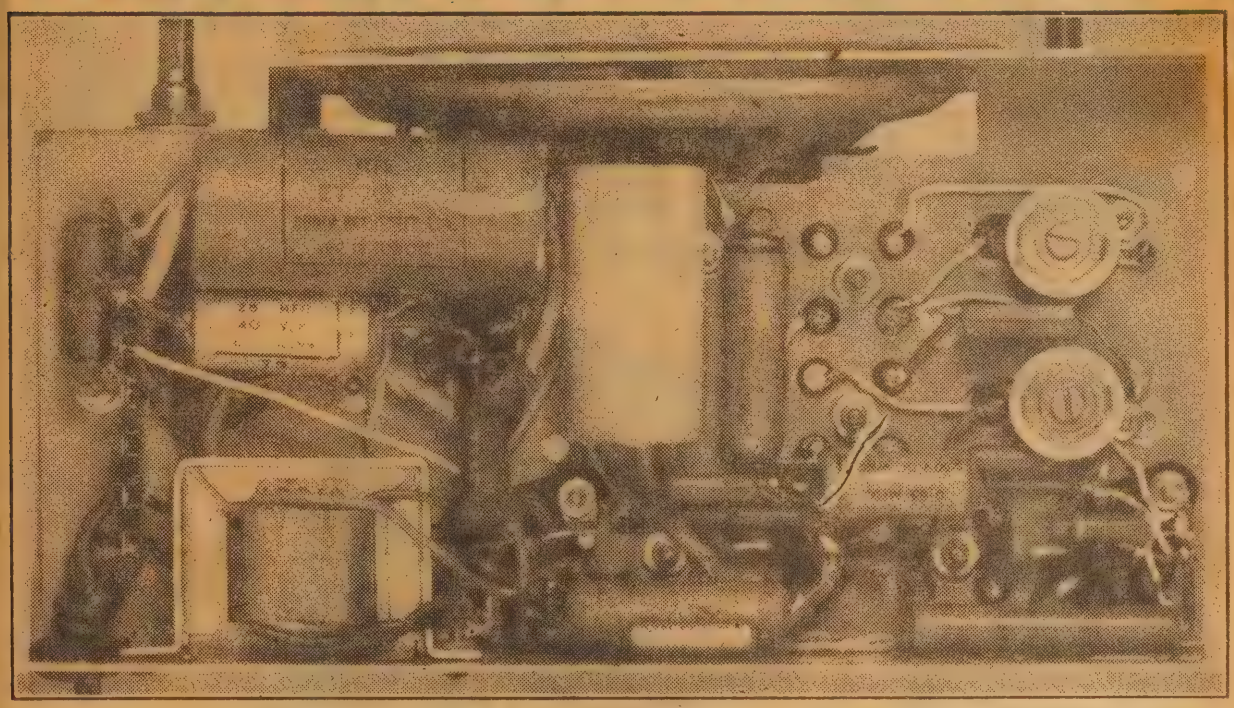
COMPONENTS LAID OUT IN ORDERLY FASHION



This view gives the general picture of the location of the minor components. Study it in conjunction with the underchassis wiring diagram and you should have little difficulty in completing the job. The aerial lead is not shown but would normally run along the top of the right hand edge and out through the rear corner.

mounted in either of two possible positions although we actually arranged it so that the leads from the secondary winding came through the inside hole of the chassis to give it its shortest run to the 6X4 socket. Place a 7-tag mounting strip under the nut of the outside front securing bolt.

In one type of transformer, the black lead from one side of the 240 volt primary winding and the black lead from the centre-tap of the secondary winding emerge from the same side of the winding layers. In such a case, you must be extremely careful not to get these leads mixed.

If you have a multimeter on hand, it is a simple matter to identify the black primary lead, say by checking for continuity with the other red primary lead. Another means of identification, although not as positive as with the multimeter, is that the black centre-tap of the secondary winding usually emerges from the layers between two yellow colored secondary leads and/or from a layer closer to the outside than the black colored primary lead.

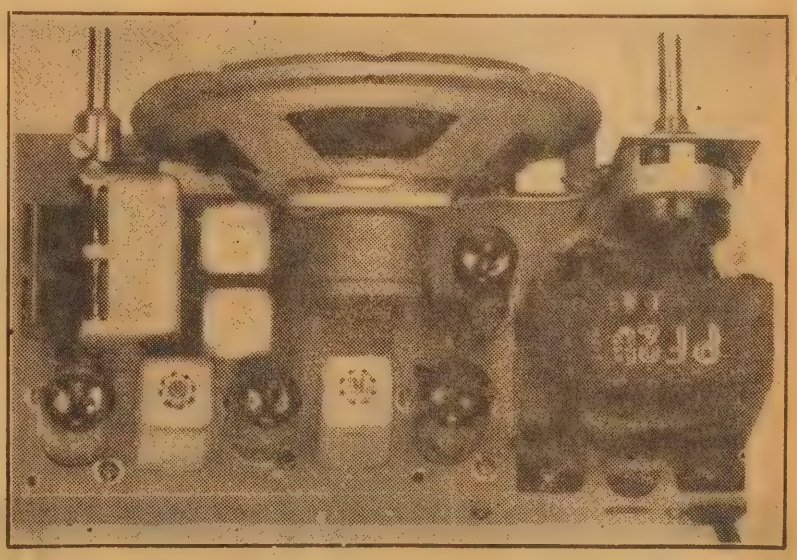
SPEAKER MOUNTING

The remaining major component, the speaker, may now be secured in position, preferably using countersunk bolts. Note that it is positioned off-centre by about 1-8in with the transformer bracket uppermost.

In commencing the wiring, it is convenient to get the power transformer leads into position and so out of the way. There should not be any further trouble in identifying the leads from the color chart which usually accompanies the transformer, assuming that the possible confusion mentioned previously has been avoided. It is neater to twist together the pair of 6.3 volt leads and the pair of secondary leads and take them to their respective pins on the 6X4 socket.

One side of the primary winding goes straight to the switch on the volume control, the other side of the switch being taken through the chassis with the other transformer leads and terminated on the 7-tag mounting strip together with the other side of the primary winding. The power flex connects to them at this point.

We have in the past on a number of occasions suggested that all solder lugs be interconnected with a run of light gauge tinned copper wire. The idea behind this is to avoid



To the right of the tuning gang are the aerial and oscillator coils in that order from the speaker. Along the rear edge from the left are the 6AE8, 1FT1, 6BA6, 1FT2 and 6BV7. The 6X4 is to the right of the speaker.

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possible obscure trouble later with a faulty connection to the chassis.

You can please yourself on this point but make sure that there is no doubt about the connection to the chassis. For instance, see that there is bright metal under the head or nut of the bolt carrying a solder lug. It is a good plan to use a star washer for such bolts if you have them on hand. Another point is to ensure that no soldering flux flows between the nut, solder lug and chassis when making soldered connection to the lug.

The centre spigot of each valve socket acts as a shield between "hot" pins and should be earthed to its adjacent solder lug. Omission to do this will more than likely lead to instability. This does not apply to the rectifier socket, of course, but we earthed it to give a convenient earthing point for one side of the 25 mfd capacitor.

On all sockets except that of the rectifier, those pins which have to be earthed can be bent inward and soldered to the earthed centre spigot.

At this stage, you could mount the output transformer and connect it into circuit. Now interconnect each pair of heater pins on the valve sockets, and lay in the straightforward wiring runs between valve sockets, coils, tuning gangs, and IF transformers. Earth one side of the heater circuit, preferably at the 6BA6 or 6AE8 socket.

Note in the wiring diagram how the aerial lead runs from the pin of the aerial coil toward and out along the outside top of the right hand side of the chassis and through the corner of the rear edge. This is not shown in the underchassis photograph. Leave about 1½ to 2ft of free length for this aerial lead. In many cases it will be all the aerial you will need to play the local stations.

INSULATE

The chassis is now ready to receive the minor components. The wiring diagram and the underchassis photograph will help you here. See that the 24 mfd, 8 mfd, and 25 mfd electrolytic capacitors are wired in the correct polarity as shown on the circuit and wiring diagrams. The red end is positive.

In the case of the tubular bypass capacitors, a circle around the body toward one end indicates that that end connects to the outside foil and should ideally connect to the chassis, when the circuit calls for it.

It is a good plan to use insulated sleeving, called "spaghetti", on the bare pigtail ends of capacitors and resistors to avoid possible shorts with other parts of the circuit.

The connections to the back-bias circuit and the 6BV7 grid capacitor and resistor are carried by the 7-tag mounting strip. Keep the leads to and from the volume control well away from the transformer primary and high voltage secondary leads. The run from the tag strip to pin 8 of the 6BV7 socket should be made direct and kept clear of the chassis.

For the .01 megohm dropping resistor to the screens and oscillator B-plus we used the 2 watt size. If this is not on hand, use two .02 megohm resistors connected in parallel.

The aerial and oscillator gang section trimming capacitors are mounted below the chassis, using the solder lugs under the tuning gang as the earthing anchor. Note that the top plate of each trimmer should be the side connecting to the chassis.

The main point to remember throughout the wiring job is that you are handling small components and care should be taken with each soldered connection to avoid an excess amount of solder which may short between pins of valve sockets or short to the chassis in the case of coil and IF transformer connections.

BEFORE MOUNTING

It is a good idea to tin the pins of these components before mounting them on the chassis. Avoid application of too much heat to these pins in case it interferes with the connection within the can.

The alignment of the set should not prove very difficult. If you have a service oscillator available, couple it to the control grid of the 6AE8 and align the IF transformers to 455 Kc. Turn the volume full on and keep the input from the service oscillator low to avoid the development of too much AVC action which would mask the finer adjustments.

Go over the slug adjustments at least twice to overcome effect of interaction. Use an output meter if you have one, it makes the job easier.

Set the service oscillator to 550 Kc, and, with the tuning gang fully in mesh, adjust the oscillator coil slug until the signal is tuned in. Set the oscillator to about 600 Kc and feed it into the aerial input. Tune in this signal and adjust the aerial coil slug for maximum signal strength.

Turn the tuning gang out of mesh, and adjust the oscillator trimmer until the oscillator is received at about 1600 Kc. Adjust the aerial trimmer to give maximum signal strength.

Go through the aerial and oscillator slug and trimmer adjustments again. Finally with the service oscillator disconnected, adjust the aerial trimmer for maximum volume from a station toward the high frequency end of the tuning range, that is, with the tuning gang about ¾ or more out of mesh.

Many readers will not have the facility of a service oscillator so here is the general idea of what to do.

Set the oscillator trimmer a little over halfway in and peak the aerial trimmer for maximum background noise, or signal strength from a station, with the tuning gang toward the high frequency end of the range. Adjust the slugs in each IF transformer for best reception of such a station, going over the adjustments twice.

AERIAL ADJUSTMENT

Tune in a station near the low frequency end of the range and adjust the aerial coil slug for best reception. Now tune in a station which is closest to the low frequency end of the range and readjust the aerial coil slug for best results. Tune in a station at which position the gang is about one-third out of mesh and recheck the aerial coil slug setting.

If a new adjustment is necessary, alter the oscillator coil slug by a turn or two and repeat the procedure of the foregoing paragraph until you obtain the least change in aerial coil slug setting between the almost-in-mesh position and the one-third-out position of the gang. This will then mean that the aerial and oscillator circuits are approximately in track with one another.

Once you have achieved this, tune in a station toward the high frequency end of the range and adjust the aerial trimmer again for best results.

The procedure may sound involved but there is a certain amount of leeway in a condition of alignment which can be considered as being good enough and that which could be achieved with the aid of a service oscillator.

To assist you in the construction of the cabinet, we have included a drawing giving all measurements as well as the details of the materials to use.

To obtain the permanent curve in the 3-ply, wet both faces of the piece, suspend it between two blocks on the bench and load the centre with heavy weights. (We used a couple of power transformers.) Allow to stand for 24 hours or until the plywood dries. It may need another 24-hour stretch, as it is un-

(Continued on Page 106)

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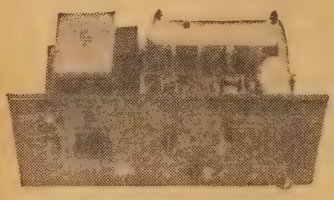
N. Single Core multistrand copper wire, plastic insulated cable with lacquered cotton woven outer insulation, ideal for car wiring, radio work etc., will carry 7 amps. 6d yd. 100yds reels 33/-.
O. 7 core Cable each core contains 13 strands wire and has plastic insulation all covered by lacquered cotton outer insulation. 1/6 yd.
P. Heavy Duty 7 core Cable similar to type O, but each core has 19 strands wire. 1/9 yd.



TRANSCEIVER

TYPE A1052 **(EUREKA MARK 2. Aust.)**

This U.H.F. transceiver has five spot frequencies selected by independent switches enabling transmission on one frequency and receiving on another. Tube line up as follows:—

3 type RL18 — 5 type EF50
1 type VR92 — 1 type 6H6
1 type CV66

It has its own power supply unit delivering 250 volts H.T. at 60ma approximately employing a synchronous Vibrator and transformer with a power input of 12 volts D.C. This transceiver could be converted to a Radio Telephone 2-way unit. They are in new condition. Price complete with valves £13/10/- each.

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This neat little meter in a bakelite case 6½in x 3in x 1¼in is all that the service man requires for his portable kit. The following ranges are available:

DC Volts -0-10, 0-100, 0-500
AC Volts -0-10, 0-100, 0-500
DC mA -0-50, 0-500
Resistance 0-200,000

The sensitivity of the meter is 1800 ohms per volt.

Price £8/8/-

Plus tax, 12½ pc. Weight 2lb.

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1. **VCR 97 Cathode Ray Tubes.** Ideal for Cathode Ray Oscilloscopes Television &c. This 6in tube is cheap at 38/6 ea.
2. **Radio Control Box BC602A** as used with SCR 522 Transceiver. A few of these only available in fair state of repair. The switches appear to be OK. **Only 7/6 ea.**
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4. **Car Radio Controls** consists of a Bakelite underdash mounting dial with tuning volume and tone control knobs. Square glass scale clearly marked from 550 to 1600 KC. Two remote control cables approx. 2ft long are provided. Suitable to be adapted to any car radio. Worth £6/10/-. **Our price £3/19/6.**
5. **Aircraft Magneto Switch Units.** Each has two large heavy duty NP Toggle Switches. **Only 2/9 ea.**

★ SPECIALS ★

6. **Semi Rotary bakelite case switches,** suitable for voltages up to 240 AC. A standard Radio knob will fit these switches. Worth 4/6. **Our price 2/- ea. or 18/- doz.**
7. 60ma 385 aside upright transformers 2-6.3V, 1-5 volt filaments. Brand new and guaranteed. Worth £3/5/-. **Our price 39/6 ea.**
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10. 250ma 400 aside upright transformer. 2-6.3V. at 2 amps, 1-5 volt at 3 amp filaments. Brand new and guaranteed. Worth £10/5/-. **Our price £5.**
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12. **Vibrator Transformers 6 volt input to 250 volts at 60ma.** Brand new. Worth £2/5/-. **Our price 26/9.**
13. Filament Auto Transformers 6 volt, 4 volt, 215 volt. Worth 12/6. **Our price 6/6 ea.**
14. **Car Radio Suppressor Condensers .1 mfd 500 volt test,** in metal case with pigtail active connection. **Only 1/-.**
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16. Shop soiled 12 volt non-synchronous 6 pin Vibrators. Worth 35/-. **Our price 5/- ea.**
17. Isocore 5000 ohm to 2.3 Speaker Transformers as used on Rola Speakers. Worth 21/3. **Our price 7/6 ea.**
18. **Speaker Transformers** suitable for Rola, Jensen and Amplion 3, 5 or 6 inch Speakers, available in the following impedances.

5000 7/6 ea. — 10,000 8/6 ea.
7000 5/6 ea. — 15,000 8/6 ea.
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19. **Genemotors PE94A.** Input 28 volts output 300V.DC at 260ma, 150V.DC at 10ma, 14 V.DC at 5 amps. Enclosed in a metal box with cooling fan carbon pile voltage regulator and efficient filter. Could be converted to 32 volt motor. **25/- ea.**
20. Amphenol Steatite Sockets, especially designed for U.H.F. These octal sockets are brand new and boxed. Worth 7/6. **Our price 3/6 ea.**
21. Metal Cabinets for mantel radios suitable to replace many bakelite cabinets now unobtainable. Finished in mottled cream.

Size 14 x 7 x 6¾ inches .. 15/-
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22. Phone Plugs suit standard type phone jack. ¼in N.P. brass shaft with black bakelite barrel. 2/9 ea.
23. MN 26C Compass Receivers, in good condition. Frequency 150 to 1500 KC with built in genemotor to work off 28 volt DC supply. Can easily be converted to 12 volt, 240 volt AC. Broadcast communication receiver.

Price with valves £17/10/-.
Price less valves £10/10/-.

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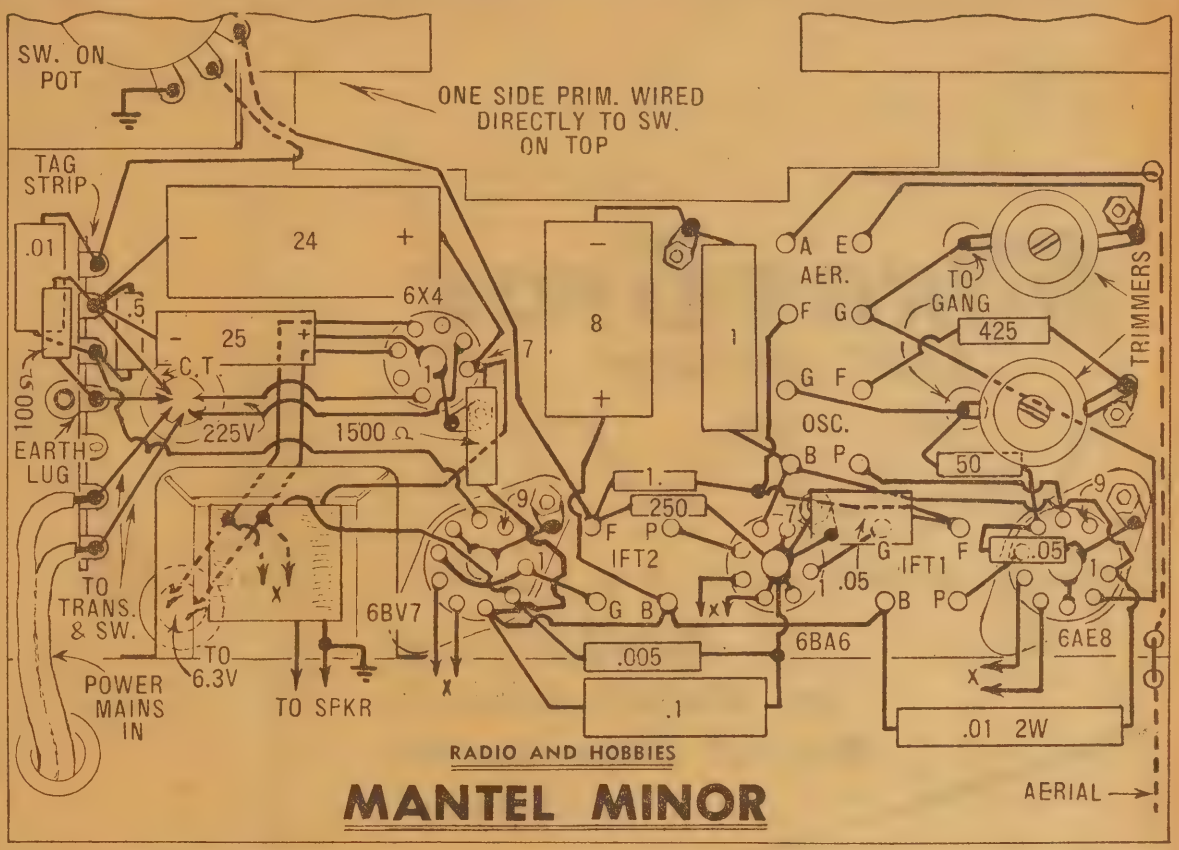
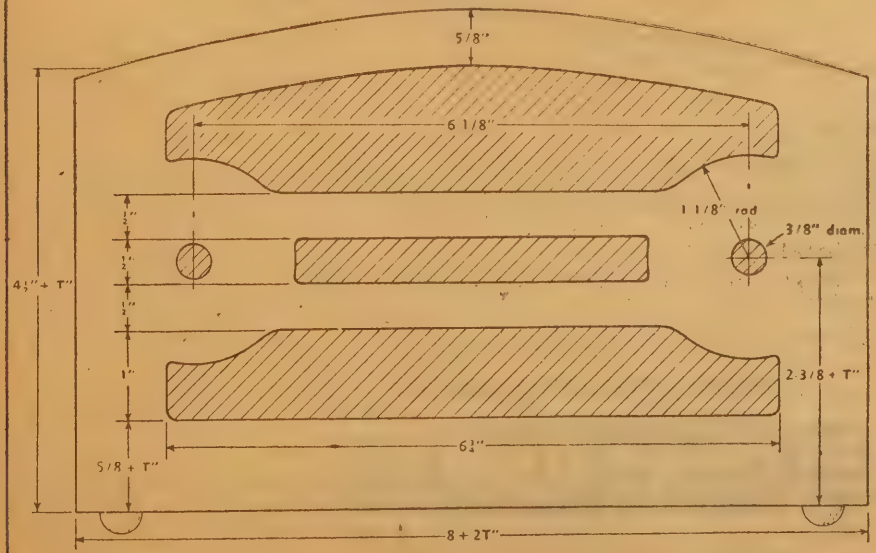
WIRING AND CABINET DETAILS OF MANTEL RECEIVER

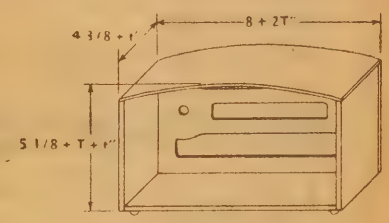


DETAILS OF PLYWOOD CABINET

The inside dimensions are 8 inches by 4-3/8 inches by 4½ inches. Curved top rises to 5-1/8 inches. Allowance must be made for thickness of material (represented by "T" & "t") when cutting top, sides and front of cabinet to size. Note that the front is cut ¼ inch oversize at sides and bottom and sanded flush with body of cabinet after assembly.

HALF SIZE DRAWING OF FRONT
(TO BE TACKED AND GLUED)





ASSEMBLY
(TACK AND GLUE CORNERS. IN ADDITION, SCREW TOP TO SIDES)

MATERIALS

Approx. 18 inches of 3/8-inch or 5/16-inch plywood 4-3/8-inches wide.

2 pieces of three-ply 3/16 inch thick 8¼ inches by 5½ inches and 9¼ inches by 4-5/8 inches

Fabric to contrast with color of cabinet.

Cardboard cut to slip against inside of front panel as frame for speaker grille material.

Casein glue.

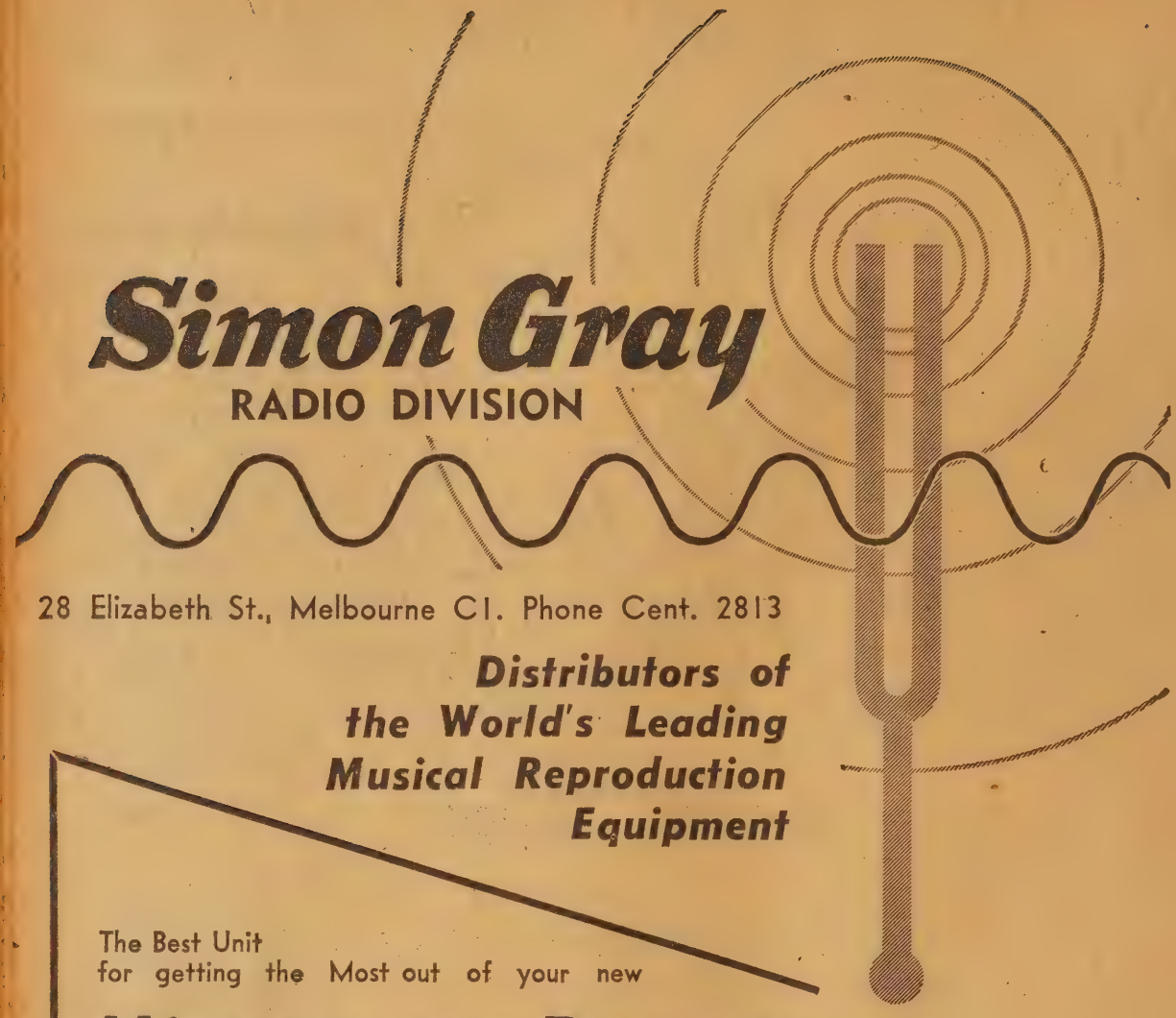
Panel pins

Wood screws.

4 rubber feet.

Cabinet details are given in the lower diagram. Compare the to diagram with the underchassis photograph and, for practice, check it against the circuit diagram as you wire. Note that some components obscure the wiring shown dotted.

Simon Gray
RADIO DIVISION



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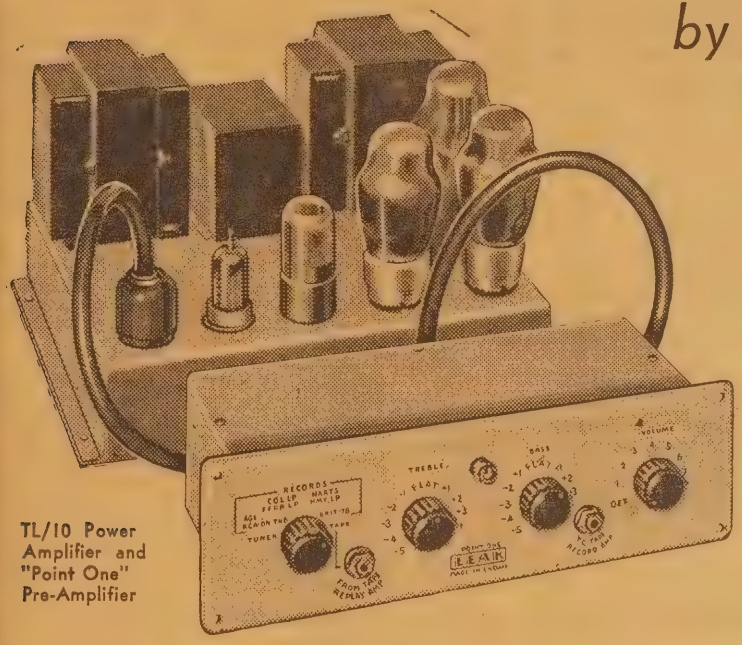

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still retaining, in every respect, the world-renowned Leak reputation for precision engineering, fine appearance and fastidious wiring.

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This Amplifier is specially designed to reproduce Music identically the way it was played, a fact for which the name LEAK is world-famous.

SPECIFICATIONS

Circuitry: A triple loop feedback circuit based on the famous TL/12. The output transformer is the same size as in the TL/12.

Maximum Power Output: 10 watts.

Frequency Response: plus/minus 1 db 20 c/s to 20,000 c/s.

Harmonic Distortion: 0.1 pc, 1,000 c/s 7.5 watts output.

Feedback Magnitude: 26db. main loop.

Damping Factor: 25.

Hum: 80 db referred to 10 watts.

Loudspeaker Impedances: 16 ohms, 8 ohms and 4 ohms.

★ **Pickup:** The Pre-Amplifier will operate from any pickup generally available in the world. A continuously variable input attenuator at the rear of the pre-amplifier permits the instantaneous use of crystal, moving-iron and moving-coil pickups.

★ **Radio:** The radio input sockets at the rear permit the connection of any tuner unit. An input attenuator is fitted. H.T. and filament supplies are available from the pre-amplifier.

★ **Distortion:** Of the order of 0.1 pc.

★ **Hum:** Negligible due to the use of recently developed valves and special techniques.

★ **Input Selector:** Radio, Tape, Records; any and all records can be accurately equalised.

★ **Treble:** Continuously variable, plus 9 db to -15db at 10,000 c/s.

★ **Bass:** Continuously variable, plus 12 db to -13 db at 40 c/s.

★ **Volume Control and Switch:** The switch controls the power supply to the TL/10 power amplifier.

★ **Tape Recording Jacks:** An exclusive feature. Readily accessible jacks are provided on the front panel for instantaneous use.

For further information contact your local dealer

Professional Engineers please Note:
The TL/10 Amplifier in combination with "Point One" Pre-Amplifier does not supersede the **famous TL/12** Power Amplifier in combination with Vari-slope Pre - Amplifier which is **still Standard Production.**

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LEAK **New** Moving Coil Pickup with interchangeable heads.

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SOME TRUTHS ABOUT AERIALS

We frequently hear stories about John Smith of back-of-Bourke who has put up a new aerial with chromium plated wire with reception improved out of sight. Or Bill Jones whose aerial of 50 strands of No. 30 wire gives him London at full strength whereas before he could hardly hear it.

WE wouldn't be so impolite when this happens as to imagine that someone has been careless with the truth. Maybe John did get better results with a chromium plated aerial, but possibly the chromium plated aerial was 30ft longer than the ordinary copper aerial with which he compared it, or perhaps it was 30ft higher.

The fellow with the multi-stranded aerial may just have happened to listen at a favorable time when he tried his new aerial.

Plenty of people believe that wire covered with insulation should not be used for aerials because the insulation will keep the signals out. Others believe that best results are obtained if the aerial is made with several lengths of wire running parallel but separated from one another.

If you investigate these stories you will find that many of them boil down to hearsay or faulty observation. In actual fact it matters very little what material you use for the aerial wire. The usual thing is to make it of stranded copper. There are some very obvious reasons why copper is used. It is readily available in the relatively short lengths required for aerials, because it is used for many other purposes in the electrical industry. Copper wire is soft, easy to bend and easy to solder.

However we can guarantee that you would not notice the difference between an aerial made of copper wire, an aerial made of steel wire or even an aerial made of resistance wire. Furthermore, even if you were to use up rolls and rolls of friction tape covering the aerial, you still would not notice any drop in the signal strength.

The choice of wire gauge depends mainly on mechanical considerations, and although a 50ft length of 30 gauge wire would receive plenty of signals, it may not remain intact for long.

AVERAGE AERIAL

If you are an ordinary listener, and want best results from your receiver, erect an aerial as high as conveniently possible (25 to 30ft is usual) and anything up to 50ft long. For the horizontal section use a length of wire which is easy to handle, and able to stand up to strong winds and a certain amount of sway from the supports. Place an insulator at each end of the wire so that it does not make electrical connection with the support. For this purpose, porcelain "egg" insulators are best but there are others which are almost as satisfactory.

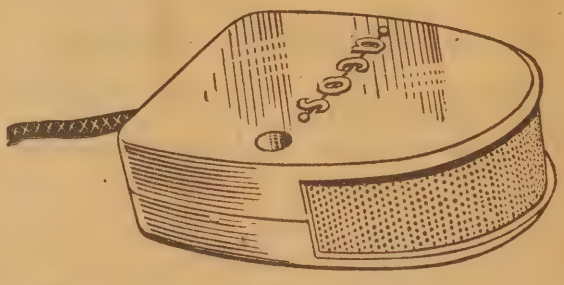
The lead-in wire should be soldered to one end of the aerial proper in order to make sure of a good connection. If you merely twist the wires there is a possibility of a poor connection causing a crackle at a later date. Bare wire can be used for the lead-in to the point where it comes into the building but it is often convenient to use insulated wire so that it can be brought right to the receiver aerial terminal without making an extra solder joint.

LEAD-IN

If there is likely to be much movement where the lead-in attaches to the building, an extra insulator would be a good precaution against the covering of the wire rubbing through.

In most cases the aerial will be attached directly to the aerial terminal of the set. The remaining earth terminal should be connected to the nearest water pipe, or to a length of water pipe hammered into the ground if there is no convenient water pipe already in existence.

Unless you are a specialist listener or have some special noise problem the arrangement we have just described will do an excellent job.



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A general purpose microphone with high sensitivity and substantially flat characteristic. Housed in attractive Die Cast Case of very robust construction is particularly suitable for use in recording apparatus — Public Address Equipment — Dance Bands — and similar applications.

Provided with built-in shunt resistance of 2 megohm giving response substantially flat from 50/5,000 cps. Resistance of the input circuit will reduce the low frequency response. A grid leak of ½ megohm will reduce the output at 500 cps by 3 dbs and pro rata at lower frequencies.

Approximate capacitance of the microphone is 750pF and cable capacitance will reduce output proportionately.

Frequency response	Substantially flat from 50/5,000 cps.
Output level	= 55 db ref. 1 volt/dyne/cm2.
Load resistance	2 megohms included.
Cable	This microphone is supplied with approximately 4ft. (1.2 metres of co-axial cable (type Unirad 32).
Weight	Microphone only — 6oz. (approx. 170 grammes) complete with packing 7oz. (approx. 198 grammes).
Dimensions	Microphone only 2 7/8in x 2 1/8in x 7/8in plus cable. Complete with packing 3 3/8in x 2¼in x 2¼in.

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MAKING YOUR EQUIPMENT SAFE

The preoccupation of radio technicians with "radio" can lead them sometimes to ignore very largely the question of electrical safety. This article, contributed by Aerovox engineers, outlines some of the simple procedures which should be standard in factories, laboratories and service shops, to protect life and property.

ELECTRIC shock and fire are the principal hazards which may accompany the operation of electrical equipment, including electronic apparatus. The first is dangerous to personnel only; the second to personnel, equipment and surroundings.

The causes often are related and sometimes are identical. Safety measures related to electronic equipment accordingly are directed toward reduction of shock and fire hazard.

Varied attitudes exist toward the potential dangers of electronic equipment. In general, the tendency is to pay little attention to such matters when apparatus is manned by skilled persons, and to become concerned only when workers with limited training and experience will be exposed.

Unfortunately, a fatal or crippling shock or a destructive fire, either incident blamable to skilled but unalert persons, must occur to point up the need for more attention in this direction.

All electronic equipment should be safe, regardless of the calibre of people assigned to its operation and maintenance. The laboratory should be no more hazardous than the assembly-line test position.

Safety measures may be applied effectively in three areas; Design, installation, and operation. When apparatus is designed for maximum safety and is installed and operated with due regard to the prevention of shock and fire, maximum freedom from danger usually is obtained.

Concentration of precautionary steps in only one area imposes additional responsibility in each of the other two and jeopardises life and property.

Safety devices and circuit arrangements can be included in electronic equipment at the design and construction stages. It is easier to build them into such apparatus than to add them later. It is well to survey the common devices of this sort, with a view to their inclusion in a given electronic product.

INTERLOCK SWITCH: The interlock switch is one of the oldest electrical safety devices, but, strangely is one of the least used in modern equipment.

Ordinarily, it is wired in series with one or both of the powerline leads to the electronic power supply unit, and is installed on the lid, cover, or door of the enclosure so as to break the circuit when the enclosure is entered.

A true interlock switch is automatic in action. It does not depend upon manual manipulation by the operator.

Multiple interlock switches, wired in series, may be used for increased safety. Thus, one switch may be installed on the access door of a transmitter, and another on the dust-cover of the power supply section.

Complex interlock systems are provided when separate circuits should be opened for safety. An example is the use of separate open-up switches for the AC power line and the high-voltage DC output of a power supply

Since electronic equipment often must be serviced "hot", interlock switches must be operable by responsible personnel when access doors are open. However, they should always be located in such a manner as to make closure difficult and, therefore, attention-catching.

Interlock switches can be used to advantage on transmitters, oscilloscopes, high-voltage power supplies, photo-flash equipment, precipitators, and television receivers.

BLEEDER RESISTORS. A bleeder resistor is connected permanently across the output terminals of a high-voltage RC power supply. As its name implies, its purpose is automatically to bleed the dangerous charges off the filter capacitors.

No medium or high-voltage power supply should be constructed without a bleeder, since high-grade filter capacitors can store murderous charges for long periods.

The bleeder resistance must be the lowest value which can discharge the capacitors quickly without excessive loading after the power has been switched off. In power equipment the resistor is chosen to give a discharge time constant of 1min.

The bleeder current is an additional load on the power supply, but the system should be designed with this slight additional burden in mind. Good insurance is provided by the automatic charge-draining action of the bleeder resistor.

CURRENT - LIMITING RESISTOR. A current-limiting resistor is an inexpensive safety device in a high-voltage power supply. It should be incorporated in every supply from which potential only, or small currents, will be required.

Such a resistor is connected in series with the output and limits the current to a safe value during short-circuit or accidental contact. A familiar example is the high-resistance (usually 1-megohm) series resistor in RF type DC kilovolt power supplies.

CAPACITOR - SHORTING DEVICES. In some equipment (eg, high-voltage radar apparatus) where large, high-voltage capacitors must be operated without adequate bleeding, the operator must discharge these capacitors before working on the high-voltage circuits.

For this purpose, metallic grounding or shorting rods with insulated handles should be chained inside the equipment within easy reach of the operator.

Short-circuiting rods, wands, or bars should be insulated beyond the voltage they will handle, in order to be grasped safely by the operator, and they should be non-removable from the equipment.

Note: Do not discharge high-voltage capacitors with a low resistance bar. A large resistor of 200 watt 10,000 ohm rating should be used.

METER PROTECTION. Old-style panel meters having metallic zero-set screws should be avoided in electronic equipment. Such setscrews run "hot" in high-voltage circuits and constitute both shock and fire hazards.

Metal-case meters should not be used except on grounded metal panels or chassis, since such instruments will, in the event of internal ground or short-circuit, have high potential on their cases and flanges.

For maximum safety, meters in high-voltage circuits should be mounted behind a window of glass or thick plastic.

AC-DC CIRCUITRY. Whenever possible, transformer-isolated power supplies should be used in preference to transformerless (AC-DC) circuits.

Although the line-operated supply is simple and compact and furnishes sufficient power for many applications, its negative return is at power-line potential and therefore dangerous.

When there is no choice in the matter, design the circuit so that no connections are made directly to the chassis or metal panel.

If the chassis must be included in the circuit, mount the completed equipment in a case or cabinet made of insulating material, and use only insulated knobs, dials, and switches.

It is good practice also to polarize the power plug of a line-operated power supply so that the circuit returns always will be connected to the grounded side of the power line.

INSULATED CONTROLS: Use metallic knobs, dials, switches, and levers only in equipment known to be of the "cold-chassis" type. Never use such attachments with AC-DC devices.

As an added precaution, short setscrews should be used in all insulated knobs, so that the operator's fingers normally will not touch the tops of these screws. When this is not possible, cover the top of each screw with a spot of sealing wax or coil-dope, after tightening.

The shafts of rheostats and potentiometers in high-voltage circuits should not be brought out directly to knobs or dials, but should be recessed far enough back of the panel or below the chassis to include an insulated shaft coupling and an ample length of insulated rod.

Another release for 1954

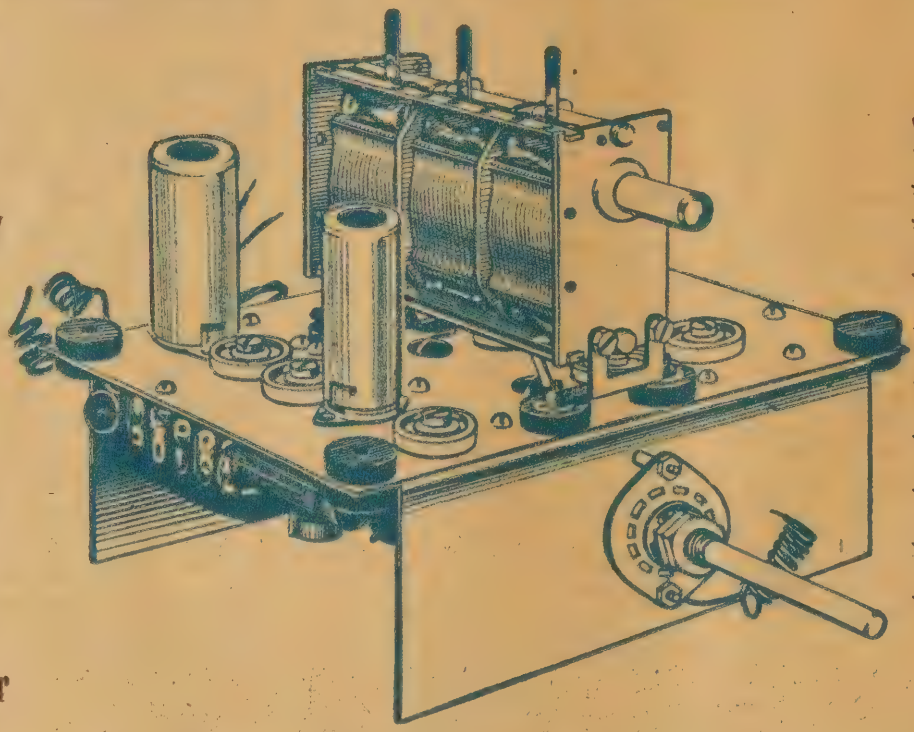
"Q-PLUS" "PRE-FAB"

TUNING UNITS

HERE'S NEWS FOR ALL RADIO SET BUILDERS

Your Alignment problems for complicated radio tuning units now solved. Simply add the I.F. and Audio stages and there you have a set equal to any in its class This unit is actually aligned and sealed. No further adjustment being necessary.

The Price Is Naturally A Little Higher Than Our Normal Unit BUT (See other side)



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YOU RECEIVE

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- ★ VALVE SHIELDS
- ★ AVC RESISTORS
- ★ AVC CONDENSERS
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- ★ ALL HARDWARE
- ★ ETC. ETC.

FIRST RELEASE IS OUR TRIPLE-WAVE UNIT

FREQUENCY COVERAGE

1. 535 — 1630 Kc
2. 2.8 — 8.0 M/cs
3. 7.5 — 23.00 M/cs

4th position Gramophone and dial.

To special order other frequency can be made to cover small ships, country, fire, etc.

SPECIFICATIONS Iron cored coils throughout using latest 6 mm carbonyl cores, moulded polystyrene formers, iron clad aerial, R.F. coil, on B/C band TWR5 requires 6BA6 RF 6AE8 converter valves, triple wave dials are available for above coverage from your distributor.

Manufactured by

R. W. STEANE & CO. PTY. LTD. Auburn VIC.

Common examples of high-voltage components of this type are the intensity, focus, and beam-centreing controls of an oscilloscope.

HIGH-VOLTAGE JACKS: Jacks occasionally are employed in power circuits for the insertion of meters, keys, output lines, &c. Good practice is to connect such jacks in the grounded B-minus leg of the monitored circuit, rather than at any point in the B-plus sections.

When this method of connection is not practicable in a particular circuit, however, the jacks should be recessed behind the main panel, where they cannot easily be touched, and clearance holes provided for insertion of the plugs.

This will prevent accidental contact by the operator, and also accidental grounding and firing as a result of contact with wires or other metallic objects.

SWITCH FIRING: Electronic circuits should be designed so as to minimise sparking, arcing, and firing in switches, relays, and similar make-and-break devices. Finished equipment must be inspected fully for verification of the design. In addition to shortening the life of the switching device, firing can create a fire hazard.

Only explosion-proof switching devices should be employed when electrical equipment is to be used in an atmosphere of explosive gas or vapor.

Mercury switches and other mercury-containing devices must be adequately protected against breakage of the glass containers.

An additional precaution is to mount a mercury switch in such a location in the equipment that the mercury will not spill on a hot surface if the container should break.

Mercury vapor is a pronounced health hazard, a factor which must be considered in addition to the electrical mischief which might be caused by the liquid metal on the loose.

POWER-LINE SAFETY: Engineers and designers are inclined to confine their safety considerations to high-voltage apparatus. It is important to note, however, that considerable hazard lies in the power-line end of electronic equipment.

Fires, bad shocks and serious burns are known to result from personal contact, short circuit, and grounding at the AC line. The danger is heightened when the supply is 220 or 440 volts.

Only line cords bearing Underwriters' Laboratories approval and in good physical condition should be employed. Such cords must pass through grommet-lined holes in chassis or panels, never through raw-edged metal.

Three-conductor line cords should be used whenever facilities are available for using the third wire as an equipment ground.

Adequate fusing of the equipment should be provided. It is a form of negligence to assemble any complete radio or electronic apparatus without including one or more fuses in the equipment itself.

POSITIONING OF HIGH-POTENTIAL COMPONENTS: Each component with exposed terminals, in medium or high-voltage portions of a circuit, should be protected from short-circuit, grounding, or accidental contact by the operator.

Such parts include selenium-rectifiers, bleeder resistors, capacitors with exposed terminals, switches, rheostats, and mains-type pilot lights.

Wherever possible, such components should be mounted under the chassis, where they are not exposed. However, ventilation requirements do not always permit this. Therefore, when it is impracticable to conceal the components below chassis, protective housings, with ventilating holes or louvres, should be provided.

When housings cannot be used, the exposed terminals of the components should be oriented away from the direction of easy contact. These expedients will lessen shock and firing.

INSTALLATION MEASURES: Permanent electronic equipment, whether in a laboratory or in a non-technical environment, should be installed in strict accordance with the Electrical Code and any applicable fire department rules and regulations as applied to wiring.

Some of the pitfalls to be avoided include: Dangling, trailing, draped or frayed power cords; overloaded power outlets; overheated or damp locations; overloaded power lines or lack of circuit breakers; and use of multiple attachments.

Provide a safety ground at every installation. This consists of connecting together with a heavy wire all of the metal panels, chassis, racks, cabinets, &c., and running this wire directly to a good ground.

In most cases, the electrical earth is an adequate path to ground, but, as an added guarantee, use a good earth ground consisting of a cold-water pipe, or a long pipe driven into moist soil.

Three-wire cords, with the third wire connected to the electrical conduit, are valuable because they connect the equipment automatically to ground whenever the power plug is inserted into the outlet.

As a rule, 3-wire power cords are mandatory in industrial installations but the rule often is not enforced in laboratories unless there have been hazardous situations or serious accidents on record.

Where 3-wire outlets are provided, do not fall into the habit of inserting 2-wire leads. Take full advantage of the safety provided.

Many commercial electronic instruments have a grounding wire in their power leads. Signal generators, vacuum tube voltmeters, amplifiers, oscilloscopes, and tube-testers are among the familiar devices so equipped. Do not ignore these leads. Use them for the safety-grounding purposes for which they were supplied.

PLACE DANGER—HIGH VOLTAGE signs conspicuously both outside and inside the equipment at all important points where an operator needs to be reminded of the hazard.

Mount an approved fire extinguisher near the equipment. Carbon dioxide extinguishers are desirable for electronic equipment fires, since they usually do not cause any chemical or moisture damage.

A proposed location for a stationary electronic installation should be surveyed beforehand with respect to favorable temperature, humidity, vibration, power-line stability, magnetic fields, and traffic conditions to determine which elements should be removed or modified in the interest of safe operation.

FAILURE versus SAFETY: Electronic equipment breaks down in spite of the best engineering and maintenance.

Failure is considered as falling into two categories. When the breakdown of a component causes dangerous overloads or voltage peaks, or places high potentials in undesirable places, the failure is said to be unsafe.

When breakdown places the system out of operation without in any way introducing trouble in the system or to the operator, the failure is said to be safe.

No blanket rule can be stated for designation of all cases. A particular failure must be viewed in terms of an analysis of the circuit or system in which it occurs, in order to determine into which category it falls.

Consider these examples: A bleeder resistor in a power supply fails unsafe because in burning open it allows a dangerous charge to be held by the filter capacitors.

A short-circuited filter capacitor also fails unsafe because it draws excessive current which may destroy the rectifier (producing much heat), filter choke, or transformer.

An open-circuited secondary winding in a power transformer in a simple power supply fails safe because it removes the power automatically from the entire system.

But the secondary would fail unsafe if the power supply furnished fixed bias voltage to high-power tubes, since these tubes would draw excessive plate current in absence of the bias.

The cautious designer of electronic equipment will take every possible precaution to favor fail-safe operation. For example, the inclusion of a fuse in series with a filter capacitor will change a fail-unsafe probability into a fail-safe situation, since the fuse will open if the capacitor short-circuits.

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ADELAIDE: Scott Sales, 99 Currie St., Adelaide.
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ELMEC 60 FERRIS ST., ANNANDALE—LM4208

Let's Buy An Argument

I think this had best be a "bits and pieces" month, in which I can dispose of a few shreds from the last issue, as well as some letters on varied subjects which have come to hand in the meantime. There's another major subject boiling up for discussion but I'll leave it over for the time being

by Neville Williams

FIRST of all, there is this matter of record compensation, which we thrashed pretty solidly last month in several of the articles. Quite a few readers, some with considerable experrence in the audio field, expressed appreciation of our efforts. They rated the analysis as "fair and objective" and the solution to the problem as "very commonsense". More than that we could not ask.

Inevitably, however, there were some who were merely confirmed in the attitude that they would never be bothered with "all those details". They would settle for a workable "microgroove" position and accept the results, for better or for worse.

WHY NOT?

And who can possibly quarrel with such a decision? If the folk concerned can gain maximum listening pleasure by accepting a compromise and NOT worrying about detail, why should they burden themselves with elaborate equipment?

Of course, such a statement invites argument with "purist types" but purist types aren't always the happiest of people, and most people want to be happy because . . . But why go any further?

Then, there were a few others who were inclined to doubt our rather airy dismissal of those rather "holy" things called curves. To be quite honest, we were rather unhappy about it ourselves but all efforts we've made since to cross-check our statements have tended to support rather than discredit them.

Even the curves themselves are subject to "official" tolerances, which allow them to overlap in many cases.

Unofficially, there's ample evidence to suggest that recording companies will freely depart from the said curves where there is a chance to make their records sound a trifle more impressive or a trifle more smooth to the "average" record buyer using "average" equipment (whatever that might be).

IMPORTANT PEOPLE?

Record enthusiasts sometimes lose sight of the fact that their patronage doesn't keep the record companies solvent. It's the "average" buyer that really counts and it's mostly his money that helps balance the books at the end of the year.

And we forget too that, while engineers are quite important people, they're not the only people in recording companies. They can't be technical purists. Their prime job in life is to supervise the production of records of sufficient quality and in sufficient QUANTITY to make the outfit pay.

Heaven help the engineer who persistently holds up production because he is worried about a point that everyone else regards as "minor". If he's not willing to compromise sometimes and use his own initiative, the powers-that-be will jolly soon find someone else who is!

For example, there's the problem of tape standards that we've mentioned in the past. We recently put this question to a recording engineer, who must perforce remain anonymous: "How much do you know about tapes from outside that are received for transcribing to disc?"

HE SAID IT!

His answer must be shocking indeed to the technical purist. Said he, "I can't remember a single case where a tape has come to hand with information about equalisation. We just put it on our machines and equalise as best we can".

That the finished records are gerally acceptable is a tribute to the engineer's resources and experience, not to curves or anyone's ability to abide by them!

And speaking of curves, an overseas airline pilot rang yesterday to say that a magazine which is not yet to hand locally carries details of a new AES curve. If this informa-

tion is correct, it would tie in with my tip last month that the old AES curve might be scrapped because of its lack of roll-off in the extreme bass.

It's also an eloquent comment when "a curve to end curves" needs itself to be revised.

But I don't want to be wholly destructive in these remarks. The approach adopted by the Editor for his Number 4 Control Unit appears to have hit the spot with a good many enthusiasts. They like it because it combines reasonably simple operation with a good degree of flexibility.

And it looks as if we'll need all the flexibility soon, if local companies continue to acquire overseas pressing rights at the present rate.

I'M SORRY!

If I had time, I'm sure I could think up a lot of puns about record labels—a real Festival of puns, just to Capitol. Puns right out of the Vox. But I'm going to the dogs—little dogs.

To change the subject rather abruptly, a reader takes me to task, as Technical Editor, for allowing to be published circuits which use a series screen feed for the 6AN7. The letter is printed in full in the panel for your edification.

At first reading, I was suitably impressed by the letterhead—a large radio firm—and by the mention of "a competent engineer". Then I read the letter again!

On the surface of things C.B. is fairly close to the truth. It is not an ideal arrangement, technically, to group together the oscillator anode, the converter and the I.F. screens, and to feed through a common series resistor.

The voltage does tend to rise with the application of signal and requires the I.F. amplifier to handle a somewhat higher signal input than might otherwise be the case.

If the converter screen were separately shunt fed, the valve gain would be more sharply reduced with AVC voltage. Less signal would be applied to the I.F. grid and less envelope distortion produced in its output.

AN OLD STORY

That we are not entirely unaware of this possibility is evidenced by the fact that we have specifically included special screen supply systems in many of our wide range receivers, both superheterodyne and TRF—for the problem remains the same.

For example, I could quote from an article which I wrote as long ago as June 1943, describing the "TRF Fidelity Nine". It reads this way:

"The screen of the first RF amplifier is fed from a voltage divider which serves to keep it more or less constant at the necessary 100 volts. The screen of the second RF amplifier is fed, on the other hand, through a series resistor, so that the screen voltage regulation is very poor.

"This is done purposely. The AVC voltage is completely effective on the first valve but only partially so on the second because, in the latter case, the effect on an increased grid bias is largely offset by an automatic rise in the screen potential.

"Naturally, The AVC is rendered somewhat less effective by this scheme but it ensures that the second valve always operates under conditions such that it can handle without distress and pass on to the diode detector a high modulated signal voltage".

This, I suggest, contains all the essence and more of what our correspondent has suggested.

It represents the kind of practice that one tends to adopt when designing equipment for specialised high-quality listening.

One tends to do all the "right" things because the cost of parts doesn't matter quite so much and it's nice to know that the design doesn't leave any loopholes for possible criticism.

But there's no guarantee whatever that anybody would have noticed the difference in practice, had a simpler means been adopted to feed the two screens!

SIMPLER SETS

The mental approach to a simple domestic set is quite different. Cost DOES matter and simplicity IS important. The urge is therefore to do things the cheap way, the simple way, provided it does not transgress operating conditions or invite criticism for bad performance.

For what it's worth, I have yet to come across a case where the particular method of screen feed has caused distortion trouble in a domestic set. Perhaps people don't use long enough aerials close enough to stations or perhaps the distortion level is low enough to be swamped by other shortcomings of the equipment.

Until it's demonstrated otherwise I can't accept the circuit arrangement as "a mistake". It appears to be perfectly satisfactory for simple broadcast receivers.

INCONSISTENT

C.B.'s dissatisfaction could have been the first case, if his letter wasn't so manifestly inconsistent.

While his whole criticism centres around the alleged susceptibility of the design to overload on strong signals, he "proves" his point by describing the serious distortion encountered with signals subject to fading!

It is self-evident that signals subject to fading must be distant ones and that the field strength from them will be far below the many thousands of microvolts necessary before one could even begin to talk about overload distortion.

Significantly enough, no complaint whatever about the local stations, which would be the ones to produce distortion.

It seems very much to me as if C.B. has done nothing more than discover that very old bug-bear of medium-distance listening — the interference between ground and sky waves with consequent fading and distortion. For this, there is no complete answer.

I'm quite certain that commercial sets suffer the very same trouble, despite C.B.'s suggestion to the contrary.

C.B.'s concern about the plate impedance of the 6AN7 is touching also but rather misplaced. Since it is already liable to swing between 1 and 40 megohms with normal variations in oscillator and signal grid volts, it's hard to see how one can afford to be too jealous of its "stability".

UNUSUAL PROBLEMS

All of which makes me wonder whether C.B.'s "competent engineer" subscribes to his views or is somewhat misinformed about the whole situation. I hope, for his own sake, that it's the latter.

Still on the topic of receivers but of an entirely different nature is the letter reprinted overleaf on "Radio Problems", from S. B., of Queenstown, Tasmania.

While it is rather a delicate course to query someone's supposedly accurate observations, I must say that I have never heard of either of the effects which this correspondent mentions. But, of course, I might have been too pre-occupied with "theory" all these years to observe "practice".

Other readers may have their own special ideas about the validity of these reported observations.

Be that as it may, I can see no justification for the idea that broadcast receivers inter-act as reported, nor do I think they can be compared with UHF receivers.

In the latter case, the aerial systems are ALWAYS resonant and always intimately coupled to the first tuned circuit. It is therefore not difficult to concede that mutual

DOESN'T LIKE OUR AVC SYSTEM

Dear Sir,

I have built your "Twin Speaker Mantel" receiver, which apparently at first performed well. After a time, I noticed a discrepancy in it that I had never noticed in commercially designed sets.

When it was tuned to a station that was subject to fading, the sound distorted. It did not actually fade, because the AVC was operating correctly.

In talking this over with a competent engineer he asked me whether I used series feed to the screen or fed it across a voltage divider from the plate supply. The 6AN7 requires this latter type of screen supply.

The reason seems to be connected with the fact that the extra impedance involved with series feed extends the control grid base considerably and reduces the control provided by the AVC. Also small changes in screen supply will cause wide changes in plate impedance. The use of a potentiometer feed overcomes this.

You seem to have made this mistake numerously: In drawing your attention to this fact, I hope to see a correction made in all future circuits of this type.

Yours Faithfully, C.B.

Make YOUR choice the Famous "B.S.R."

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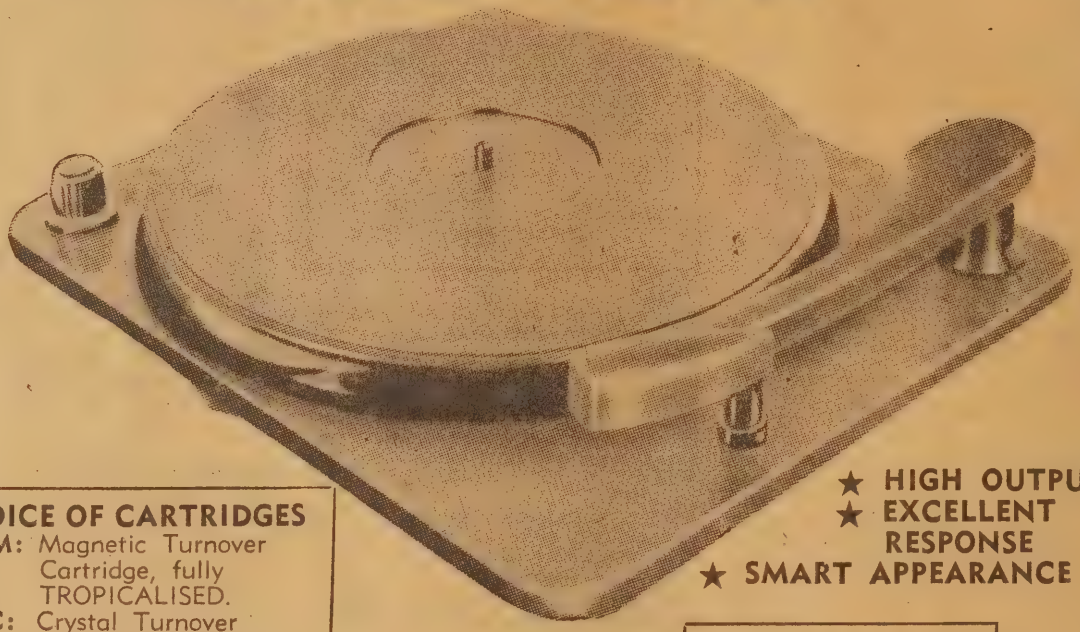

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★ **PICK-UP:** Lightweight pick-up of excellent response both in Magnetic and Crystal types . . . requires no weight adjustment compensation or pre-amplification. Twin-sapphire, for standard and microgroove, with turn-over knob change.

★ **SPEED CHANGE:** By external knob marked for 33 1-3, 45, 78 R.P.M., and employing the "Rotocam" method—simple and absolutely reliable.

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★ **FINAL SUSPENSION:** Final mounting is achieved by suspension springs fitted to deck plate . . . acoustic feedback is entirely eliminated.

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effects might occur in a compact group of UHF equipment.

However, broadcast receiver aerials are NEVER self-resonant and are not so intimately coupled to the first tuned circuit.

Therefore, while each aerial must have some effect on the overall field pattern, the effect would be no more serious and just as random as that of all the other pieces of wire round about, from street mains to domestic clotheslines.

Furthermore, the amount of aerial "tuning" should be negligible and it is therefore hard to see how readers in a district could rob one another of signal strength.

LINE VOLTAGE

The thought that did occur to me was that switching on a lot of sets at a particular time might affect the line voltage in a country district. Unfortunately such an explanation would hardly suffice for 1928!

I'm also puzzled and rather unconvinced by S.B.'s second query. Again, I must say that I have never heard of his detuning effect. I wonder whether he is being misled by overlapping and interference problems which might force him to tune the weaker station a little to the side away from the strong one?

Careful observation and the use of instruments might put a different light on the story.

From his last paragraph, the correspondent would seem to have automatic frequency control in mind but I'm afraid that it's stretching things a bit far to draw an immediate parallel between the operation of a complex AFC circuit and his reported observations.

I think we should call for more evidence!

While awaiting it, you might care to switch your attention in yet another direction.

Every now and again, we get letters like the one reproduced above under the title "ULTRA-TELEVISION?"

PERPETUAL MOTION

Occasionally such letters come from actual Radio & Hobbies readers but, more often, they're from folk who have no normal interest in technical radio. However, since their problem has to do with technicalities, they're as likely to pick on a broadcast station as a radio magazine. We happen to be the latter.

Sometimes it's about perpetual motion (electrical version), sometimes it's a cure for static (always original), sometimes it's sickness produced by radio waves (privately diagnosed), sometimes it's the kind of half-technical enquiry, as in this present letter, mixed up with an obviously personal or pseudo-political background.

Occasionally the letters are couched in such terms that, like the oft-repeated phrase, "you can't 'elp laughin' . . ."

But it's manifestly unkind to laugh at another person's attempts to grapple with a subject they don't understand. How comical must some of the laymen's ideas and the theories and cures appear to the trained medico! (Occasionally the reverse is true.)

How can a farmer or a pensioner or a housewife be expected to know the limitations of things like oscillographs and photo-electric cameras — if there be such things?

Radio has progressed so rapidly, bridged so much time and space that the non-technical observer can be forgiven for crediting it with potentialities beyond present fact.

EXPECT SURPRISES

They have been conditioned to expect and accept all kinds of new discoveries and principles. They know that things are being done which defy attempts at a simple explanation. How then can they be certain that their suspicions of a person or a circumstance are not founded on a scientific possibility.

Who among us, right now, is perfectly certain in his own mind about the nature of the current "Flying Saucer" reports.

Unless my powers of observation are failing, I'm pretty certain that the types who scout the whole thing as "rubbish" have a horrible suspicion that there might be something in the reports, after all.

Conversely, the apprehensive folk are obviously worried lest they be made to look foolish.

Most people prefer to sit on the proverbial fence — if they can find enough room!

But, to get back to the present letter, I haven't the faintest idea what our correspondent is worried about, apart from the fact that he is apparently suspicious of some clandestine operation involving a radio circuit.

In this respect, he is by no means unique.

But what an accomplishment it would represent if the ideas suggested in his letter were possible?

Think of it: Visual and voice contact over a range of "thousands of miles" with little or no equipment!

And not just an ordinary television transmission but full-scale two-way contact!

This very day, as I write, the papers carry the story of "Eurovision" — an elaborate microwave network which has allowed television programs to span Europe.

MILLIONS OF POUNDS

It has cost something like two million pounds and estimates for similar world-wide links run to £20-million for Europe-America and £100-million for Europe-Australia!

These links are the subject of research by the world's top radio brains. Think what some of the big companies would pay for a system which would obviate the need of million-pound radio links and allow

RADIO PROBLEMS

The following question may have sufficient interest to be worth investigating and perhaps writing up.

Query:—Is the signal strength from any given transmitter decreased when a large number of receivers tune to it at the same time?

Due to the very low signal micro-voltage I have always taken it for granted that signal strength would not be affected. However, because of our district being anything from 100 to 1000 miles from broadcasting stations, the question of daytime signal strength and interference is a problem.

As far back as 1928 I have noticed that Melbourne broadcasts of Melbourne and Caulfield cups have faded from just before to just after the broadcast. This could be due not to decrease in signal strength (simply) but to reflecting effects from similarly tuned aerials, such as is made use of in beam aerials.

In U.H.F. I had a case where accidental grouping of say six receivers resulted in some receivers weakening and others improving. Also receivers radiating a back feed of the signal into the aerial could decrease a neighbor's signal by phasing. Hence there are at least three aspects to my query.

My point of view is that if my experience can be verified then for special broadcasts the P.M.G. should organise a temporary increase in transmitter aerial power.

Questions such as this are often very enlightening. Also about 1928 I found that with the old RF amp. valves as operated on a partly curved grid voltage-plate current curve, a powerful station altered the tuning of a weaker adjacent station.

Interested because of an interference eliminating theory (still not experimented right out), I later discovered that the tuning shift was caused by a leading voltage (similar to freq. modulation principle) caused by the strong station in the first RF tuned circuit.

Hence I was experiencing through a phenomena, a principle I did not realise for many years —viz—Freq. mod. tuning.

S.B. (Queenstown, Tas).

ULTRA TELEVISION?

I have been making enquiries regards Ultra S. W. Radio Photo Phone and how it can be possible for a party thousands of miles away to keep in contact with people in Sydney and yet possess no instruments. Also the party in Sydney is able to see everything that the party is looking at and still conduct a two-way conversation.

I have had several answers such as an oscilloscope or oscillograph, cathode-ray tube and photocell camera, taken on this individual, but as you will note no proper answer is forthcoming. No one but the party can hear in Sydney.

No static. It seems more like a graph as the instrument is controlled by modulation. Reflections of the operators can be radioed in the sky. Everything that this party is looking at can be seen in Sydney. Momentum appears to be essential and all sound and every conversation noted. We know it can happen, but how?

Vibration plays a great part.

(Name and address withheld.

—Ed.).

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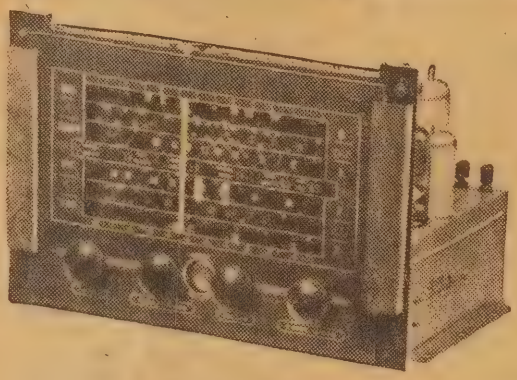

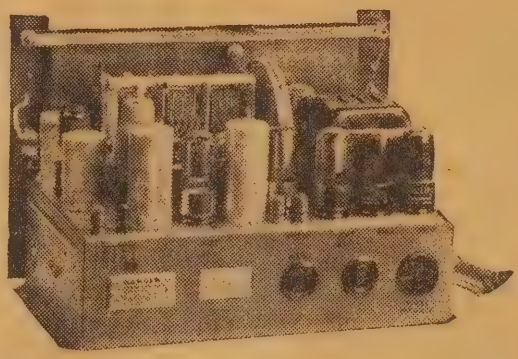

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- Power switch is fitted to the tone control of all chasses thus enabling the power to be completely switched off from the set. Radiogram switch combined with wave change switch.
- Tuning is made simple and positive even on oversea stations by the use of a super sensitive magic eye tuning indicator.
- All chasses are wired for the fitting of an F.M. or Tape Recorder. Special plug on back of chassis being provided, also standard 3-pin socket for power supply to motor.
- Speakers supplied are Magnavox 12in and 8in permanent magnet with tropic proof transformer.
- Large calibrated edge-lit dial in plate glass (11in x 7in) with main stations in each State in prominent type, fitted with counterweight drive and indicator lights on dial showing which band in operation.
- Dial can be supplied in cream or brown with matching knobs and escutcheon to suit blond or walnut cabinets.

ALL CHASSES CARRY SIX MONTHS' GUARANTEE.

A New 10-Valve Dual-Wave Radiogram Chassis

The ideal chassis for those difficult locations where reception is doubtful

Specifications as nine valve unit but with the addition of high gain tuned R.F. stage giving greater sensitivity and selectivity on both broadcast and short wave bands.

£38/15/-

Large range of Radiogram and Console Cabinets from £12

Record Players and Changers

We have a complete range of 3-speed record playing equipment, including B.S.R. or Garrard Players, with turn-over crystal pick-ups or your choice of Garrard, Stromberg-Carlson, Collaro or the new B.S.R. 3-speed changer that will play 7, 10 or 12in records intermixed. All changers have turn-over Crystal pick-ups.

CLASSIC RADIO

245 Parramatta Rd.,
Haberfield, N.S.W.
Phone UA2145

them to bridge across thousands of miles with next to nothing.

Since the world's best brains and the world's biggest television interests can't do it as yet, it's impossible to be very optimistic about the chances of Tom, Dick or Harry in the Australian backblocks.

At the "present state of the art" I'd be willing to go on record as saying that the proposition suggested by our North Queensland correspondent is completely and absolutely impossible.

I'm speaking, of course, in terms of radio techniques and radio equipment, in the present sense of the word.

I would certainly not rule out the ultimate possibilities of so-called "mental telepathy" of which we know so little. The day may come when our present methods of transmitting sound-wave and picture components may seem even more primitive by comparison than the original telegraph system is to us today.

WAVES—AND WAVES

I wonder how Bob Dyer and Jack Davey would make out with a morse key?

But, of course, the possible connection between "radio," "mental telepathy" and "brain waves" is pure speculation and, I imagine, not even accepted by many people.

One can speculate about "television" receivers of the future in which loudspeakers and cathode-ray tubes would give place to electrodes attached directly to the recipient's head. Signal currents between the electrodes would initiate brain currents, creating directly the appropriate sensations of sight and sound.

One can imagine signals being originated the same way, obviating the TV camera and the microphone. Imagine observers at a performance with electrodes strapped to their heads, picking up their brainwaves and modulating them directly on to a radio circuit.

At the receiving point the audience, reacting directly to these impulses, would "see" and "hear" the performance through the eyes and ears and mind of the observer. (I tremble at the social implications.)

Perhaps the brain electrodes could be replaced by remotely placed devices capable of intercepting thought in one brain and stimulating it in many others.

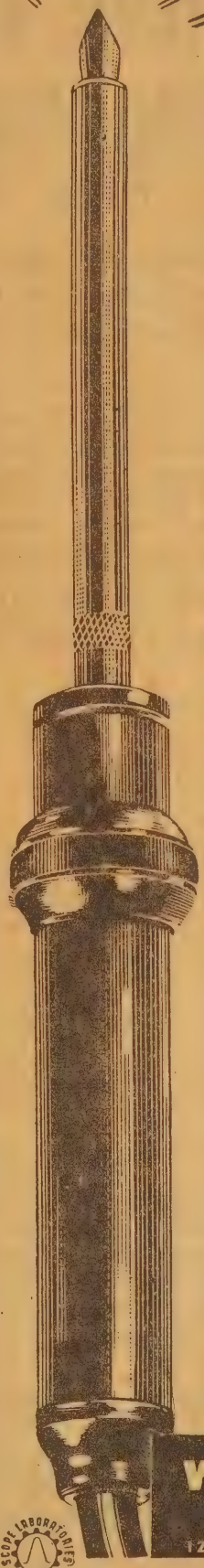
PERHAPS—

But all this is in the realm of "perhaps . . . perhaps . . . perhaps . . . "

George Stephenson may have dreamed of mighty locos thundering over vast railway networks. His dreams were capable of fulfilment but were so remote in time and technique from his day that lots of informed people must have regarded Stephenson as an impractical ratbag.

In exactly the same way, a recital of possibilities as above, can earn their author a similar title. Who can say whether they're a logical forecast or plain rubbish?

But all this scarcely applies to the letter on hand. For the time being I'm afraid, our correspondent in Queensland will either have to revise his apparent suspicions or redirect his enquiries to a magazine specialising in the occult.



COMPARE THIS IRON WITH THE ONE YOU'RE USING!

Scope is a new type of soldering iron that gives amazing soldering speed and efficiency whilst operating from low voltages, or from mains with transformer. To really appreciate the value of Scope you should test Scope for yourself. If you do this, you will agree it is the soldering iron you should and must have. Visit your electrical supplier today.

SCOPE SOLDERING IRONS

CHECK THESE FEATURES:

1. Heats up in six seconds ready for continuous use.
2. Weighs 3½oz, 10 inches long.
3. Operates on low voltage (2.5/6.3 volt A.C. or D.C. from mains with National Transformer (optional supplied), or from a car battery.
4. Is as effective as irons rated to 150 watts.
5. Amazing efficiency on delicate as well as heavy duty jobs.
6. Unique design ensures that heat is applied only where and when required.
7. Switches off automatically when put down.
8. No frequent tinning and cleaning necessary.
9. Replacement parts are always available, and easily fitted.
10. Scope is fully guaranteed.

RETAIL PRICE: Iron, 50/-

National Transformer, 47/11.

VISIT THE SYDNEY ENGINEERING EXHIBITION

July 5th to 10th, and see Scope Soldering Iron, Vibroscope, new portable industrial Electroplating unit all in operation. They are displayed at

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in the Commemorative Pavilion, Showground, Sydney.

Australian and Overseas Agents:

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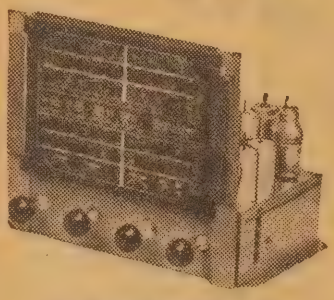
SCOPE LABORATORIES MELBOURNE

N.Z. Distributor: H. W. Clarke, Auckland & Wellington.

NEW FIVE VALVE DUAL WAVE RADIOGRAM-CHASSIS



£17/17/6
PACKING and FREIGHT EXTRA

FULLY GUARANTEED

These chassis give excellent local, interstate and overseas reception, and are fitted with pick-up terminals and radiogram switch. On-off switch is fitted to enable power to be switched off from set.

Supplied tested and complete in every detail with five standard valves, 6J8G, 6SK7G, 6SQ7G. 6V6G, 6X5G, and 12in Rola or Magnavox speaker.

SHOP-SOILED—3-SPEED—RECORD CHANGERS

COLLARO
3/511 and 3/521
3-SPEED CHANGER

With lightweight, high fidelity twin crystal heads.

£11/10/-
FREIGHT EXTRA

STROMBERG CARLSON
VELVET-ACTION
3-SPEED CHANGER

With turn-over crystal pick-up.

£15/17/6
FREIGHT EXTRA

PLESSEY
3-SPEED MIXER
RECORD CHANGER

With high fidelity crystal pick-up dual stylis.

£11/17/6
FREIGHT EXTRA

NEW PHILIPS MICROGROOVE RECORD PLAYER

Philips and Mullard two-speed (78 and 33 rpm) microgroove record players. These units are fitted with a high fidelity turn-over crystal pick-up and automatic stop.

£5/19/6 Postage NSW 8/-; Interstate 12/-. (extra).

Portable leatherette cabinet suitable for above .. **£3/15/-**

Cabinet suitable for record changer .. **£5/10/-**

Synchronous motor and drive in this unit is ideal for tape recorders.

NEW COLLARO SINGLE-SPEED RECORD PLAYERS
Type AC54 single-speed record player with high-fidelity crystal head and automatic stop. For 240 Volts AC operation.

Special Price
£3/5/0
PLUS POSTAGE
Interstate 8/6, NSW 5/-

ROTHERMEL SAPPHIRE NEEDLE PLAYS 2000 RECORDINGS, 5/6

CRYSTAL PICK-UP CARTRIDGES
Rotherme high fidelity pick-up cartridges, replacement for most pick-ups.
10/6 each

METROPOLITAN RADIO SUPPLIES
479 Parramatta Rd., Leichhardt, N.S.W.
(At top of Taverner's Hill)
PHONE LM3610

NEW—SPEAKERS—AT—HALF-PRICE

6in SPEAKERS

PERMAGNETIC WITH 5000 OHM TRANSFORMER

39/6

POSTAGE AND PACKING

	NSW	Interstate
12in SPEAKERS	7/6	12/6
6in SPEAKERS	5/-	8/6
TRANSFORMERS	1/6	

12in SPEAKERS

HEAVY DUTY PERMAGNETIC WITH 5000 OR 10,000 C. T. TRANSFORMER .. ..
WITH 15,000 OR 20,000 TRANSFORMER 50/-
Separate Transformers to suit any of above speakers—5000 ohm 8/6 each (Supplied with speakers only)

54/-

NEW—DYNAMIC—SPEAKERS

New 7in dynamic speaker by leading manufacturer 1500 ohm field coil, 7000 ohm transformer -- -- -- **27/6**

New ovaltone dynamic speakers 9in x 6in 1000 ohm field and 5000 or 7000 ohm transformer -- -- -- **27/6**

SPECIAL PRICE FOR QUANTITY

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POSTAGE AS ABOVE

NEW VALVES IN CARTONS

12SH7 .. .. 7/6	6K7G 8/6	307 .. .. .. 22/6
12A6 .. .. 12/6	6U7G 12/6	866 .. .. .. 20/-
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12SJ7 .. .. 12/6	6SK7GT .. 12/6	809 .. .. .. 30/-
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9001 .. .. 10/-	6SN7GT .. 10/-	VR99 .. .. 15/-
9004 .. .. 10/-	6SH7 .. .. 7/6	955 .. .. .. 10/-
AV11 .. .. 9/9	7193 .. .. 5/-	954 .. .. .. 10/-
1K7G 9/6	1T4 .. .. .. 15/-	6SH7 in dozen lots
1M5G 9/6	VR65A 3/6	each 5/-
1C7G 11/6	6AG7 .. .. 12/6	1K5 in dozen lots
1L5G 10/6	1K5 .. .. .. 3/6	each 2/6

Please add postage.

New Electrolytic Condensers

12 mfd-525V **4/6** each or **48/-** dozen plus post
8 mfd-350V **2/6** each or **24/-** dozen plus post
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16 mfd-350V **3/-** each or **30/-** dozen plus post
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NEW GERMANIUM DIODES TYPE 4A42

Ideal for use as Crystal Detectors, Noise Suppressors, etc -- -- -- -- -- -- -- -- -- -- **7/6**

POST FREE

NEW COILS AND INTERMEDIATE TRANS, By A LEADING MANUFACTURER

Permatune I.F. trans. 455K.C. -- -- -- --	9/6
Aer. Permatune B.C. coils 455K.C. -- -- --	7/6
R.F. Permatune B.C. coils 455K.C. -- -- --	7/6
Osc. Permatune B.C. coils 455K.C. -- --	7/6
Aer. Permatune S.W. coils 16-50M -- --	6/6
R.F. Permatune S.W. coils 16-50M. -- --	6/6
Osc. Permatune S.W. coils 16-50M. -- --	6/6

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(At top of Taverner's Hill)

PHONE LM3610

NEW VALVE SOCKETS

Teleton 8-pin octal moulded sockets **5/-** per dozen or **25/-** per 100.
American 8-pin Loctal high insulation **5/-** per dozen or **25/-** per 100.
Ceramic Acorn Sockets **2/6** each

CARBON RESISTORS

Well known make of carbon resistors in values of 100 ohms to 5 megohms. In 1-watt, ½-watt and 1/3 watt. All resistors are standard colour coded and in original cartons. In lots of 100 mixed values comprising 50 1-watt, 25 ½-watt, 25 1/3-watt .. **12/6**

Post, 1/6.

IN LOTS OF 500, 50/-.

Standard Resistor and Condenser Colour-code card supplied with resistors.

SOLDER

English multi-core solder in 1lb reels.

12/6 per lb

Postage extra.

NEW MERCURY SWITCHES

The switch with a 1000 uses.

2/9 each

SPECIAL PURCHASE 100 NEW "PAILLARD" RECORD CHANGERS

The "Paillard" record changer has a variable speed motor making it ideal for dance halls, etc., and is fitted with a high fidelity crystal pick-up. Sapphire needle supplied with each unit.

BARGAIN PRICE **£7/18/6**

In original cartons — freight extra.

NYLEX HOOK-UP WIRE AT HALF-PRICE

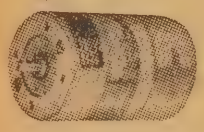
Nylex hook-up wire 10/.010 in 100 yard coils, each coil consisting of five 20 yard lengths in 5 different colours.

10/- PER 100 YDS. Plus postage.

NEW---AMERICAN TELEPHONE WIRE

Rubber insulation with stainless steel and copper conductors supplied on metal reels each containing half-mile of wire. **£1/15/- per reel** case lots, each containing six reels (three miles of wire). **£10** PER CASE F.O.R.

A MOTOR WITH MANY USES



Small 24-volt ball-bearing motor suitable for AC or DC, reversible operation, fully laminated. Approx. one-fifteenth H.P. Size 3¾in x 2½in. ¼in Spindle.
Mounting bracket supplied ... 39/6
Transformer suitable for above ... 30/-
Postage extra

Heavy Duty Genemotor

Suitable for conversion to A.C. motor (approx. one sixth H.P.) Fully laminated. Can be used as 6 or 12 volt generator at 20 or 13 amps £2/17/6 f.o.r.

NEW H.F. RECEIVERS AND TRANSMITTER

Complete with fourteen 6.3V valves and plugs, etc. Ideal for 144 MEG. Band. New in carton F.O.R Genuine bargain **£4/17/6**

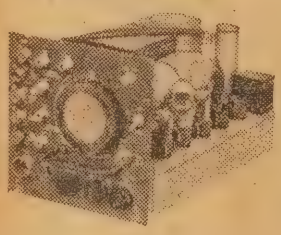
Photostat of circuit 7/6 extra.

£1/-/-
Postage N.S.W. 4/6
Interstate 8/6

PORTABLE TEST SET

Containing 2½ inch 0-50 millimeter, six point key switch, &c., in case. (Used equipment.)

AMERICAN INDICATOR UNIT



These indicators are ideal for conversion to cathode ray oscilloscope having a built-in power supply, the power transformer only needs changing, and there is plenty of room for a time base tube etc. Supplied complete with the following valves:—
3BP with full length mu-metal shield, two 6SN7GT, two 6H6, one 2X2, one 6X5 and one 6G6G .. .. Freight extra **£8/17/6**

TRANSFORMER TO CONVERT THIS UNIT FOR 240 VOLT OPERATION AVAILABLE AT £3/15/- EXTRA plus postage

MIDGET GENEMOTOR

Input 28 to 32 volt at 1.1 amp output. 250v
New in carton at 60MA **£2/15/-**
Used but in good order **£1/18/6**
Postage extra.

Input filter supplied with genemotors

28 VOLT GENEMOTOR

Input 28 to 32 volt at 1.5 amp.
Output 250V at 100MA. Used but AS NEW ... **£1/15/-**
POSTAGE EXTRA

6-VOLT GENEMOTOR

Input 6 volt Output 500 volt at 160 MA.
£6/10/- F.O.R.

HIGH-VOLTAGE GENEMOTOR

Input 12 volt. Output 1200 volt at 200MA.
£6/10/- F.O.R.

VERNIER DIAL

American velvet vernier dial 100 to 1 calibration. Supplied with ceramic coupling **20/-**

METROPOLITAN RADIO SUPPLIES

479 Parramatta Road, Leichhardt, N.S.W.
(At top of Taverner's Hill)
PHONE LM3610

OIL FILLED CONDENSERS

2mfd. 1800V	17/6
4mfd. 200V	4/6
8mfd. 500V	10/-
1mfd. 600V	5/-
.5mfd. 2500V	6/6
.25mfd. 3000V	6/6

Postage extra.

A.R.8 RECEIVERS

AR8 Receivers made by A.W.A. Eleven valves. Covering all frequencies from 140 K.C. to 20 M.C., valves required 3—6A8G, 4—6U7G or 6K7G, 1—6J7G, 1—6J5, 4—6B8G, 1—6X5G. (Circuit and plug supplied).

Price less valves and covers £9/10/-

Less valves, covers and dials £5/17/6

Freight extra.

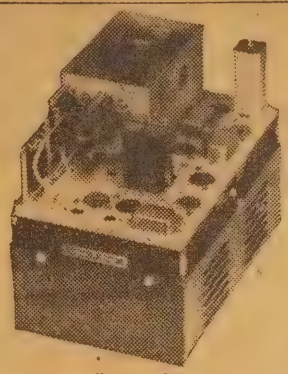
A.T.5 TRANSMITTERS

AT5 Transmitter in good condition less valves. Frequency coverage 140 K.C. to 20 M.C. Valves required 3—807 and 2—6V6. (Circuit supplied).

Less valves £5/5/-

Less valves and covers £4/5/-

Freight extra.



17/6

PLUS FREIGHT
BY PASS. TRAIN ONLY

Not recommended for interstate as freight is too high.

I.F.F. CHASSIS

CONTAINED IN ALUMINIUM CASE

HF Oscillator, frequency approx. 200 m/c, complete with 10 high insulation octal sockets, two 7193 valves, IF transformer, 45 insulated carbon resistors, mainly 2 watt, 24 paper and mica condensers.

A.R.7 COMMUNICATIONS RECEIVER

These popular receivers covering from 140 KC to 25 MCS In five bands. Feature single strength meter, crystal gate, noise limiter, two RF and two IF stages.

Supplied complete with nine valves, five sets coils, AC/Vib power supply, speaker and mounting rack.

AIR TESTED **£47/10/-**

HIGH-POWER I.R.C. RHEOSTATS

250 ohm, 25 watt.

10 ohm, 2½ amp; 25 ohm, 1 amp Price, each **10/6**

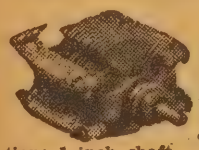
50-CYCLE A.C. AMMETERS

Range 0-14 Amps. Scale Size 4in. Dia. Brand New.

Price, each,

45/-

Packing and postage: N.S.W., 1/6, Interstate, 2/6.



BUTTERFLY CONDENSERS

Capacitance range 3-35 microfarad. Size 1½ x 2½ x 2½ inches. brass plates: Ultra high frequency insulation: ¼ inch shaft.

Price, each **7/6**

Packing and postage: NSW, 1/-; Q., T. and V., 1/6; W.A., N.T., 2/-.

New A.W.A. VIBRATORS

6 volt A.W.A. gas filled vibrators, heavy duty, synchronous.

Price **15/-**

(Special price for quantity.)

D.C. GENERATORS

12V 750 watt. Ideal Home lighting, Battery charging, etc.

PRICE £4/10/- F.O.R.

TRICKLE-CHARGER KITS

Kits for trickle-charger as described in R. & H., June issue. Comprising transformer with 18V winding tapped at 12V-3 100mA rectifiers and 50 ohms control.

Postage: NSW, 5/-; Interstate, 7/6. **39/6**

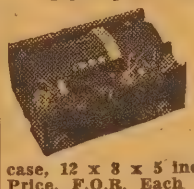
1143A. TRANSCEIVERS

(English equivalent to SCR 522)

Frequency range 100 to 156 m/cs Complete with 20 6.3V Valves. New condition, supplied in transport case.

£12/12/- plus freight

SCR 522 GENEMOTORS



28 volt input D.C., regulated and filtered output filtered D.C. 300 volts at .26 amps; 150 volts at .01 amps; 14.5 volts at 5.0. Completely shielded in metal case, 12 x 8 x 5 inches.

Price, F.O.R. Each **55/-**

A.T.5-A.R.8 POWER SUPPLY

24 volt genemotors supply containing two genemotors, one giving 550 volt at 350 mills and the other 250 volt at 100 mills, also contains filter condensers, relays, fuse holders, etc.

£4/10/- **F.O.R.**

TYPE 1133 TRANSCEIVER

Freq. range 90 to 130 m/cs contains 17 6.3 volt valves.

£8/17/6

METROPOLITAN RADIO SUPPLIES

479 Parramatta Road, Leichhardt, N.S.W.

(at top of Taverner's Hill)

PHONE LM3610

TRANSFORMER SPECIAL

H.D. Power Transformer, 265 x 265 250mA 4v Fil. Windings £2/5/-

H.D. Power Transformer, 365 x 365 150mA 4v Fil. Windings £2/5/-

C.R.O. Transformer, 1540, 2V Filament Winding £2/5/-

150mA Filter Choke £1/2/6

Prices F.O.R.

NEW MN26 COMPASS CONTROL-BOX

37/6

6in Flexible drive for above, 10/-. 24in, 18/6.

Postage extra.

SPECIALS

Carbon Mike Inserts	2/6
Bakelite Fuse Boxes	4/6
5-Position Push Button Switches,	12/6
Carbon Mike Trans	4/6
Double Button Carbon Mikes ..	7/6
Throat Mikes	5/-
Cutler Hammer Switches	2/6
Shielded Hook-up Wire, yard ..	8d
3 gang Standard Condenser	20/-
Twin Co-ax Cable, 20ft lengths ..	6/-
2 gang Condenser	16/-

NEW WESTON & FERRANTI METERS

0-.5 amp. RF thermocouple	9/6
0-3 amp. RF thermocouple	9/6
0-4 amp. RF thermocouple	9/6
0-10mA DC	17/6
0-20 volt DC	17/6
0-5 amp. DC	27/6
0-10 amp. DC	27/6

(All above are 2in flush mount.)

0-10mA DC English Turner 3in Round Flush Mounting 30/-

Postage Extra.

A READER BUILT IT!

Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

GEIGER COUNTER OPERATES FROM VIBRATOR SUPPLY

If you are interested in prospecting for uranium-bearing minerals, this design of a Geiger counter may give you some ideas. Submitted by a reader from Murwillumbah, the unit employs two valves and operates from a small 6-volt accumulator.

URANIUM prospecting has caught the imagination of many people in recent times due largely to the possibility of gaining a sizeable reward from the Government for a worthwhile find. We published articles on this subject in the March, April and May issues of 1954, the description of a portable Geiger counter in the April issue creating quite a lot of interest.

Mention was made in the March issue of various methods of obtaining the operating voltage for the Geiger-Muller tube. In the circuit diagram shown here, the design centres around vibrator cartridge and transformer operating from a small 6-volt accumulator.

Our contributor is Mr. W. N. Smith, of 106 Codong Rd., South Murwillumbah. He bases his design on robustness and lack of need for specialised components rather than on economy of operation or minimum total weight.

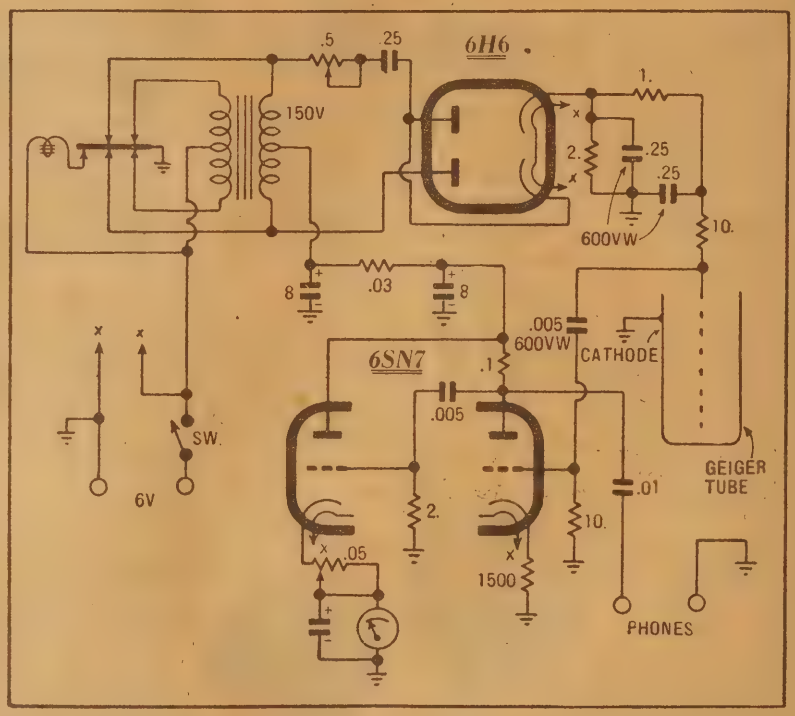
The total drain from the accumulator is of the order of 1 ampere. As Mr. Smith puts it, there is no problem with charging the accumulator from a car electrical system or from a home lighting plant. Of course, with accumulators of low ampere-hour rating, the charge rate has to be watched to avoid damage.

VIBRATOR SUPPLY

The anode supply for the 6SN7 and the EHT for the Geiger tube are obtained from 150 volt per side vibrator transformer. It is wired in the usual fashion on both the primary and secondary sides to give the lower voltage output through a resistance-capacitance filter to the 6SN7.

The method of obtaining the EHT is interesting. It functions in much the same manner as a conventional half-wave voltage doubler circuit with the halves of the 6H6 arranged to give a positive polarity at the output. The usual buffers capacitors employed in a conventional supply are omitted.

Our contributor quotes an output of about 600 volts from the supply. To control the voltage to suit the type of Geiger tube, the output capacitor is shunted with a 2 megohm resistor and a .5 megohm potentiometer is wired between the transformer secondary and the capacitor feeding the first rectifier anode.



Assuming that the connections to the transformer primary (or secondary) are selected to give a positive output at the secondary centre-tap, as with any other vibrator supply, the operation of the EHT voltage-doubling circuit is as follows:

By the action of a vibrator primary contact, a positive potential will appear alternatively at each end of the secondary, the opposite end in each case being earthed by a secondary contact.

Considering the instant at which the lower end is positive, the first half of the 6H6 will conduct and charge the .25 mfd series capacitor. The upper end of the secondary is positive on the next half-cycle, and the full secondary voltage is added to the voltage across this capacitor and rectified by the second half of the 6H6 to charge the .25 mfd output capacitor.

The pulse from the Geiger tube is amplified by one triode section of the 6SN7 and heard in the phones. On a slow rate of count, such as the "background count" of a Geiger tube, some "hash" interference from the vibrator supply will be heard in the phones. The "hash" will disappear for the duration of each pulse from the Geiger tube.

METER CIRCUIT

The amplified pulse is also taken to the grid of the second triode section, which is used to actuate a meter to give visual indication of the count rate. The higher the count rate produced by a mineral specimen, the higher is its radioactivity. Our contributor used an .35 ampere RF meter ex disposals with the thermocouple removed.

This section is operated near plate current cut-off. On receipt of the positive pulse from the pulse amplifier, it conducts heavily and charges the electrolytic capacitor. All pulses are integrated by the capacitor and the meter reads the average voltage appearing across it.

The value of the electrolytic should be selected to produce a fairly steady reading on the meter, without too much tendency toward sluggishness. Some compromise may be necessary.

TRADE REVIEWS AND RELEASES

STENTORIAN SPEAKERS AVAILABLE AT J. H. MAGRATH

Pictured at the right is an interesting pair of speakers made by the Whitely Electrical and Radio Co. of England and sold under the name of Stentorian, a trade mark well known in various parts of the world.

THE two operated together are claimed to have a frequency reponse of 30-14,000 cycles.

The bass speaker is of 10 inches diameter and is mounted in a cast frame with a magnet assembly having a 12,000 gauss rating. The voice coil diameter is one inch, the cone resonance 35 cycles and rated power 10 watts.

The cone is made of impregnated cambric, by a process for which the makers claim great lightness and rigidity.

The tweeter is of the pressure type. The voice coil is at the rear of the field assembly, wound with aluminium wire, and attached to an aluminium diaphragm. Output comes through the centre of the magnet which forms part of the horn. A small flair and a central phase equaliser complete the unit.

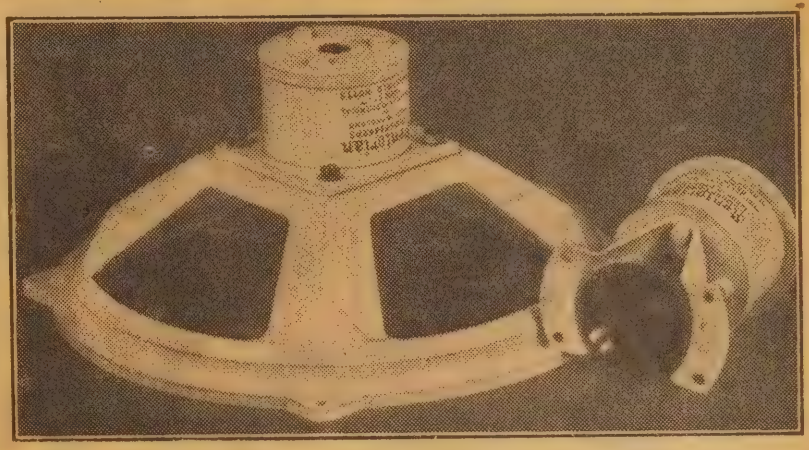
The tweeter response is given as being from 2000 to 14,000 cycles with a voice coil impedance of 15 ohms, 3 watts power handling capacity, and a flux density of 14,000 gauss.

The price is surprisingly low at £11 for the pair, the tweeter alone being priced at £6.

Our tests indicated that the speakers certainly produced the frequency range claimed for them. Mounted in a large baffle, output was maintained right down to about 30 cycles, although the power capacity did not appear to be as high as quoted. It would not need to be for ordinary home use. The tweeter may be a little more efficient than the bass speaker, but we had to build our own network for the test and it may not have been optimum.

The makers give some figures for a suitable coupling network to cross at 3000 cycles, but we would suggest 2000 as a more suitable figure.

At the price these speakers are bound to interest the wide range enthusiast, particularly the tweeter which can be successfully used with other combinations if desired.



The wide range speaker pair made by Stentorian.

TURNTABLE REDUCES RUMBLE, "WOW"

A gramophone turntable currently being marketed by A. F. Knowles should be of special interest to readers whose record enjoyment is marred by rumble and "wow" troubles.

MADE from solid aluminium, cast and machined to size, the turntable is advertised as a "drop-in replacement" unit for BSR motors, types MU-14 and GU-4. Because of its greater mass than the original pressed-steel turntable, and its improved dimensional accuracy, it can be expected to run more smoothly, particularly at the slower speeds.

The shaft has been machined to the same diameter as the original but a suitable ball may have to be dropped into the housing to adjust the turntable height and also provide for end thrust.

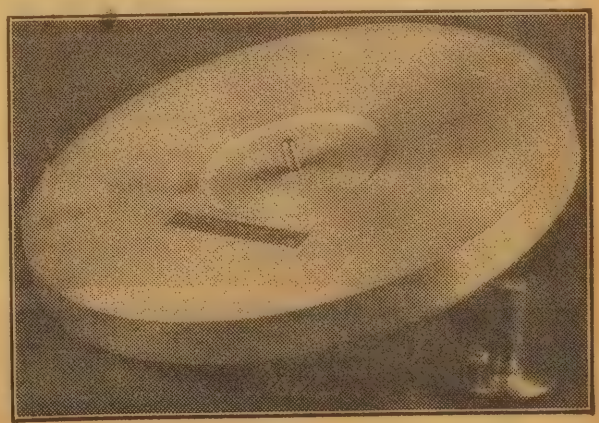
For an additional charge, a machined bronze bush is available, which can be installed in the original motor plate, if the constructor feels inclined to tackle the job.

A sample turntable, supplied for test, was tried on two different types of BSR turntable, one a current 3-speed model, the other a much older 2-speed unit which had developed definite "wow" troubles on 33 rpm.

Rumble, which was evident in both under high bass boost conditions, was much reduced with the new turntable in place, while "wow" could only just be detected on the previously faulty one, on unusually sustained piano chords.

In all, the fitting of a new turntable and due attention to lubrication would seem to be a worthwhile step for readers who wish to gain an improvement on present results without committing themselves for one of the very expensive motors.

The turntables are quoted at £6/7/6, bearings at 15/- and postage 8/6. They are available from A. F. Knowles, 149 Union Rd., Surrey Hills, E.10 Vic.



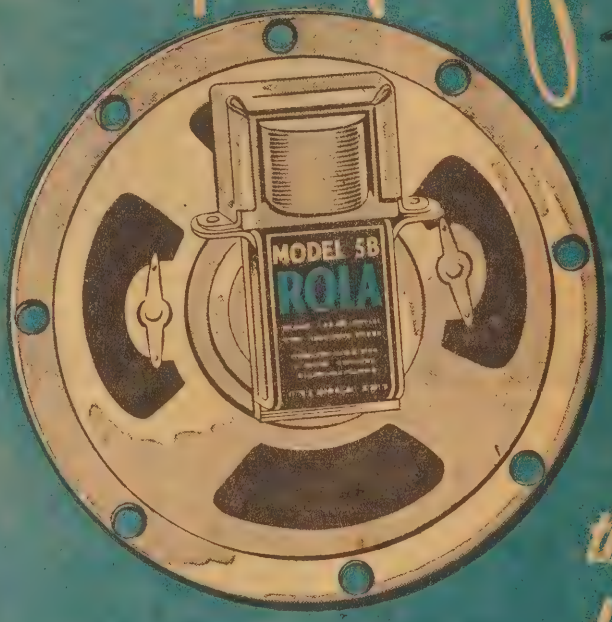
Cast and machined from aluminium, this turntable will directly replace the pressed-steel unit normally fitted to BSR type gramo motors. The bronze bearing, also shown, is an optional extra item.

AWA Appointment

MR., L. A. HOOKE, Managing Director of AWA has announced the appointment to his organisation of Cecil Gidley as Liaison Officer.

A graduate in Economics from Sydney University, Cecil Gidley was until recently an executive with Metro Golwyn Mayer in Sydney which he joined after discharge from the A.I.F. some nine years ago.

for Performance +



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TECHNICAL HIGHLIGHTS

Model 5B uses the famous Rola "Flux-master" principle of centre block construction and is designed to provide peak performance at minimum cost.

The diaphragm fitted to Model 5B has a fundamental resonance of 150 cycles per second ± 5 c.p.s., a value selected to give good bass response even when the loudspeaker is baffled only in a midget receiver cabinet. This fundamental resonance, together with a carefully engineered mid and high frequency response, combine to provide very pleasing reproduction through the full range of frequencies the speaker is likely to be called on to cover.

SPECIFICATIONS

Power handling capacity	2½ watts
Diaphragm resonance	150 c.p.s.
Frequency response	145 c.p.s. – 6.5 K.c.
Voice Coil Impedance	3.5 ohms at 400 c.p.s.
Principal dimensions:	
Housing diameter	5"
Baffle opening diameter	4"
Voice coil diameter	5/8"
Depth front to rear	1-15/16"

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TWO NEW EDDYSTONE RECEIVERS

Users of communication equipment in both the HF and VHF bands will be interested in the recent release, under the Eddystone trademark, of two new receivers intended for these bands. These are types 680X and 770R respectively and the specifications should appeal particularly to the professional user of such equipment.

THEY have been developed for all ceiver designed to cover from 80 Kcs to 30 Mcs in five bands, and vith adequate overlap of each band o ensure continuous coverage.

Fifteen valves are employed in all nd the set has practically every eature required of a set for com- nunication listening. Two RF stages rovide an adequate image rejection, while two IF stages ensure ample ensitivity and selectivity. Four de- rees of selectivity are available, as well as a crystal filter with phasing ontrol.

The AVC circuit is most effec- ive, keeping the output level within) db for a 100 db change in input signal strength. Associated with the detector circuit is a noise limiter, while the audio section has a wide frequency response, push-pull out- put, and provision for pickup con- nection.

Other features are the large, easy- o-read dial with mechanical band- spread, "S" meter, clearly marked controls, and a particularly robust construction, proofed for tropical service.

The 770R is a six band receiver providing continuous coverage from 19 to 165 Mcs and intended to handle the variety of signals normally found in this portion of the spectrum.

Nineteen valves are employed, including RF amplifier, separate oscillator and mixer, four stages of IF amplification, plus FM limiter and discriminator circuits. Germanium crystals are used for AM detection and noise limiting. Sensitivity is better than 5 microvolts on all bands.

In addition to AM or FM reception the set may also be adjusted for narrow-band (15 Kc) or wide-band (75 Kc) FM reception.

The audio channel is intended to provide high quality output from those FM channels which warrant it, having a wide frequency response and push-pull output. Power available is four watts.

Further details of either set may be obtained from the agents, R. H. Cunningham Pty. Ltd., 118 Wattletree Rd., Armadale, Victoria.

NEW RONETTE PICKUPS

Amalgamated Wireless, 47 York St., Sydney, announce that two new turnover cartridges have been added to the Ronette "Tonofluid" range in the TO-284 series. They are types No. TO-284T and TO-284TS.

THEY have been developed for all cases where a cartridge of very high output voltage is required, together with a frequency response providing a minimum of surface noise. The nature of the frequency response curve is such that this minimum of surface noise is not accompanied by too serious a loss of the higher frequencies.

It is claimed that the output voltage is so high that a sensitive output valve can easily be excited to full output without the need for pre-amplification, even from long playing records. Nominal output voltage for the TO-284T is 1.3 across a 1 megohm load and, for the TO-284TS, 2.5 volts across a 2 to 5 megohm load.

In order to obtain the maximum output voltage it is essential to use the specified loads and also to keep the capacitance of the connecting cable to a minimum. For moderate lengths of cable shielding is not required but the high value of potentiometer may present a difficulty with locally available units.

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100 ONLY IMPORTED CLOCK MOVEMENTS.

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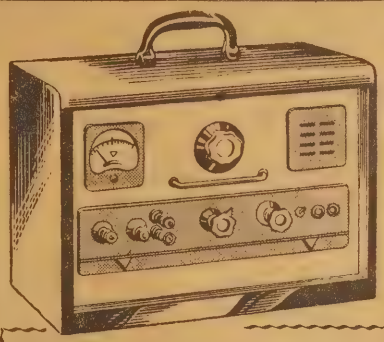

TRIMAX

Model G1

IONISATION TESTER

for

Non-Destructive Testing of Insulating Materials

CHARACTERISTICS:

The Ionisation Tester, Type G1, has been designed for use as either a field, production or laboratory test instrument. To this end, it has been constructed in a portable form.

SPECIFICATIONS:

Output Voltage. — 50-1000 volts (on 1kV terminal) 500-10,000 volts (on 10kV terminal).
Current Ranges. — 0-2 uA, 0-20 uA, 0-200 uA.
Resistance Range. — 400,000 megohms max. at 10 Kv, and proportionally at lower voltages.
Ionisation Detection. — By small loud speaker or by head phones (with speaker muted).
Amplifier Gain. — Exceeds 100 db.
Amplifier Frequency Range. — Approx. 500 c/s to approx. 7 kc/s.
Power Consumption. — 50 VA max.
Power Supply. — 200-250 volts A.C. 40-60 cycles.
Dimensions. — 16 x 8½ x 11½in high.
Weight — Approximately 30lbs.

The modern method of testing insulating materials is by use of the newly-developed Ionisation Tester, illustrated in this advertisement. With this Tester, the material under examination does not suffer destruction. This instrument is simple and safe to use and gives a correct and true indication of the dielectric strength and insulation resistance of all insulating materials. This instrument also incorporates a 3-range Microammeter which enables an insulation resistance test at any voltage within the ranges of the instrument to be performed.

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REPORT ON THE HGP-40 PICKUP

Since the release, some months ago, of the Acos HGP-39 heads and the HGP-40 pickup using them, we have had many requests for information about performance. Are they free from peaks, are they better than the older GP-20's, and, more particularly, will filters designed for the GP-20 work with the newer cartridges?

THESE are some of the more specific questions. In addition, there are always folk who are concerned with the broader issue... "Is a crystal pickup worth considering, or should I buy a magnetic or a moving coil type?"

To this last question, there can be no unqualified answer, because no one class of pickup has all the advantages. Neither, for that matter, are all pickups in any one class of equal merit.

One can only take the broad view and sum up the position as it is at the moment. And, at the moment, crystal pickups appear largely to have captured the popular market throughout the world, because of relative cheapness of manufacture, high signal output and ease of "approximate" frequency compensation.

SMALLER SALES

In terms of bulk sale, the magnetics, the moving coils, the variable reluctance and others have been left far behind, although still in strong demand by more specialised users.

Into this category comes the record lover, the connoisseur, who is not so much interested in price, output or problems of compensation as he is in the ultimate quality of reproduction. He is quite prepared to buy or to build special amplifying equimpent if it should seem desirable.

For this specialist market manufacturers have produced a variety of high quality pickups, using the magnetic, the moving coil, the variable reluctance and the piezo-electric principles, according to their own facilities and ideas.

Their products represent a completely different answer to the eternal compromise between price, performance and simplicity.

Be that as it may, practically all the crystal units currently on sale have been designed primarily for bulk sale on the popular market. As a first requirement, therefore, they must have sufficient output to drive an ordinary receiver-type audio system and enough inherent low frequency boost to correct the base deficiency of an average record.

They must sound "pleasing", when played through an inexpensive speaker, be convenient to use and free from obvious mechanical defects.

Most of the current crystal pickups satisfy these prime requirements and, therefore, find ready applications in playing decks and record changers. But, not surprisingly, most of them also exhibit resonance peaks and other limitations on performance which rule them out for really high quality listening.

ORDINARY RADIOGRAMS

That is why we have paid only scant attention to pickups of the "turnover" and "multiple stylii" type. They have their place in ordinary radiograms but scarcely justify serious attempts at frequency compensation.

It is a clear anomaly to spend time and money building an elaborate amplifier, couple it to a wide-range speaker system, and then feed it from an unambitious pickup on a playing deck or record changer.

The Acos GP-20 was in a somewhat different class because, due to its single-stylus construction and less restricted treble, it proved to be capable of fairly wide frequency response when adequately compensated.

For this reason, we went to a good deal of trouble with it and described, in the November, 1952, issue, a resonant filter using a standard 100mH whistle filter coil. The purpose of this fiter was to suppress the pickup's rather prominent 5-6 Kc peak and allow its response to run in more orderly fashion to a virtual cut-off at about 13 Kc.

SOMEWHAT LUCKY

There was a good deal of luck in the way this filter worked out, both in the availability of a suitable inductor and the way we were able to steer the various resonance effects. —However, lucky or otherwise, a large number of filters were built up by our readers. Many, who had purchased the GP-20 to feed into conventional amplifiers, subsequently made up the filter as suggested and offset the loss of gain and bass response by adding a compensating pre-amplifier stage to their equipment. In all it was a fairly happy solution.

The manufacturers have now superseded the original GP-20 type cartridge with a new one boasting higher needle compliance and a flatter, more extended initial response. Hence the GP-39 heads, which are available for standard or LP records. They will fit the original GP-20 arm and, when sold complete with arm, constitute the GP-40 pickup.

As we have pointed out in the "Let's Buy An Argument" series, one cannot base judgment of a pickup on a single sample. Neither can one place too much reliance on published curves, because they may represent a general response for the type, with individual peculiarities "averaged out" of existence.

"AVERAGE" HEAD

Accordingly, we obtained six samples each of the standard and LP heads, taken at random from the distributor's stock. These were tested, an average struck and the head selected for individual testing which fell closest to the average.

There were differences between all heads, of course, but no more than one would expect from production differences in heads and styli.

Our first series of tests, as summarised in figure 1, were for the guidance of readers who may want to use the new head under the simplest conditions—namely, fed into a 0.5 meg.

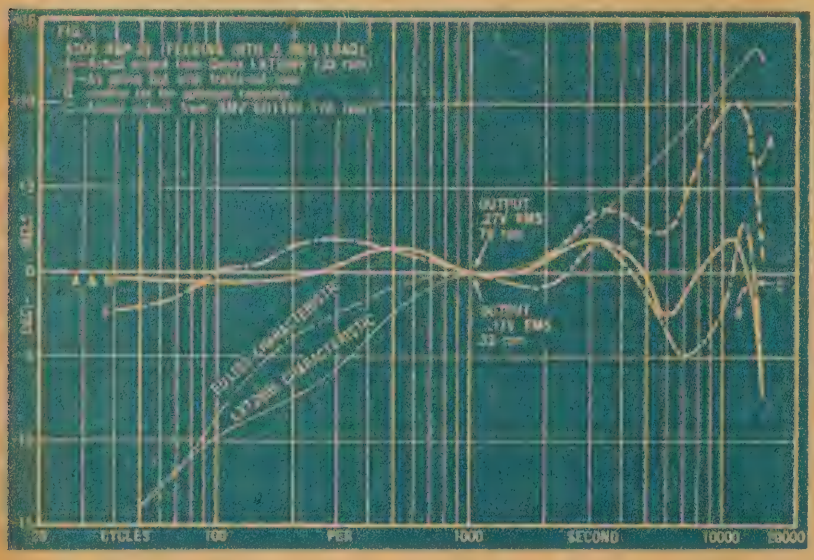


Figure 1. These curves will interest readers who want to feed the pickup into an ordinary amplifier with a 0.5 meg. input volume control. They show actual output from the pickup when playing test records with typical bass cut and treble pre-emphasis.

volume control at the input of a conventional amplifier.

Under these conditions, the pick-o can be expected to compensate part for the usual bass recording ss.

Curve C shows the actual output om the pickup when feeding into 0.5 meg. load and playing across ne 78 rpm test record ED1189 HMV). This is recorded to a fairly ypical EMI-cum-European charac-eristic and the curve therefore epresents what one can expect from ne pickup when playing ordinary iscs of this type.

As can be seen, the response does ot vary from reference by more han 2 db. from about 50 to 5000 ps. It drops to a trough of —5 db. t 7000 cps, then rises again to a eak of +3 db. at 13,000 cps, drop-ing thereafter to a complete cut-ff.

OUNDS WELL

Remembering that a 5 db. increment scale tends to exaggerate the ppearance of response curves, the ickup should—and does—sound ell, when playing records under hese straightforward conditions.

The microgroove test, carried out n a currently available Decca disc. produced curve A. The bass compensation due to the pickup is almost perfect but the treble output rises markedly above 1000 cps, reflecting the pre-emphasis in the disc.

If this pre-emphasis is offset by suitably retarding the treble control, as fitted to most amplifiers and receivers, the solid curve B can be achieved. This falls within about plus and minus 2 db. from 40 to 14,000 cps.

A point that is immediately obvious is that the new cartridge has no detrimental peak in the 5-6 Kc. region and its response therefore sounds smoother, with a lower noise level.

It is equally obvious that a filter system designed for the GP-20 is completely unsuitable for the GP-39/GP-40. Quite evidently, by modifying the compliance, coupling and damping, the manufacturers have eliminated the peak which we have hitherto been combating electrically.

OUTPUT FIGURES

As for output, this was read as 0.27 V. RMS from the test track at 78 rpm and 0.17 V. RMS at 33 rpm. On past experience, this would represent a peak signal drive on loud passage of something between 2.0 and 2.5 volts — sufficient for any ordinary amplifier. We will have more to say about these figures later.

So much for the pickup in its simplest application. Our second line of investigation was to assist those wishing to use the pickup with amplifiers of the "Playmaster" type, or one of the commercial equivalents.

Most of these employ separate control units, designed for use with low output pickups and providing compensation for a variety of recording characteristics.

The immediate problem is to devise a network which will reduce the available output, allow the pickup to feed into a grid circuit of fairly

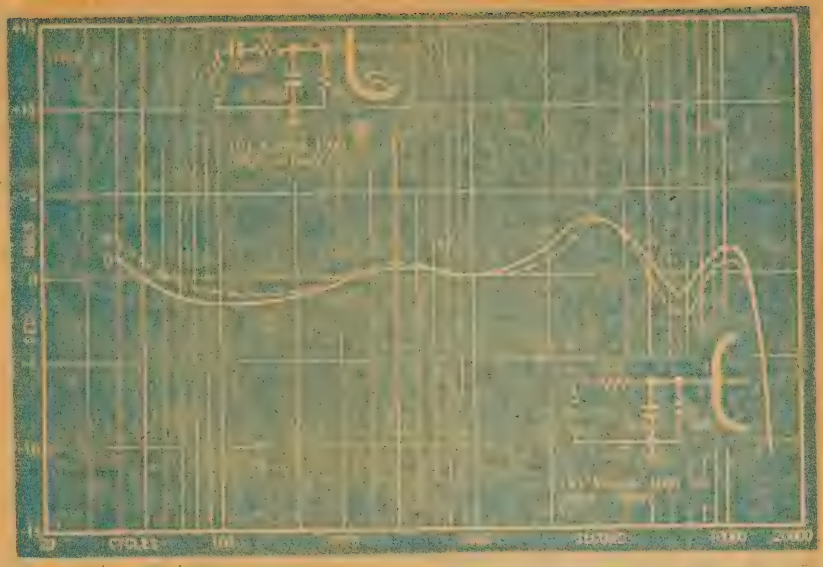


Figure 2. The performance of the microgroove head with two types of filter compensating it to constant velocity characteristics. The curves differ from figure 1 because they assume that the amplifier will have accurate built-in compensation for the recording characteristic.

low impedance and also change the pickup's natural amplitude characteristic to a velocity characteristic. In other words, it must be made to behave as a magnetic pickup.

Various simple schemes were tried with indifferent success. The idea of running a crystal pickup into a low value of load does cut the bass response but may not reduce output sufficiently. It can also leave a nasty lump in the lower middle register.

Shunting the pickup with a parallel capacitor (up to, say, .01 mfd.) can reduce the output to any required figure but leaves untouched the pickup's natural bass rise.

Coupling the pickup to a low impedance grid circuit through a small capacitor (say, .0001 mfd. into .05 meg.) is another method sometimes suggested. The obvious difficulty of this scheme is to predict the pickup's own capacitance, then to discover a value which will lower the bass response by the right amount and deliver the right order of output.

By the time the conflicting requirements are satisfied, the single coupling capacitor is likely to grow into a complete capacitive network.

Our preferred approach has centred around two different R/C networks, one suggested by the manufacturers and the other suggested by ourselves in the last issue. Both had to be modified slightly to approximate a true velocity characteristic with the typical pickup.

Referring to figure 2, curve "D" shows the natural response of the pickup when fed through a high impedance coupling network to a 50,000 ohm grid circuit. It is along similar lines to those suggested by the manufacturers for feeding the pickup into a commercial "Leak" or other similar amplifier.

It is generally assumed that the

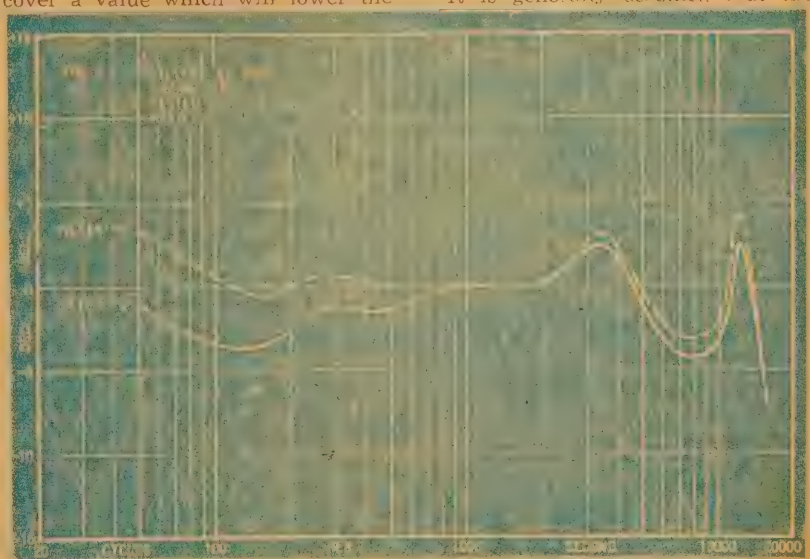


Figure 3. Here is the performance of a typical 78 rpm head with the same two filters as shown above. The low impedance filter "E" appears to be the more consistent in its control of response with different heads.

50,000 ohm resistor will be already installed in the amplifier but, in any case, it must constitute the total impedance from grid to earth.

It is important to realise that this curve represents the natural response of the pickup and not the actual output under test. The bass cut and treble pre-emphasis have both been subtracted to leave only the pick-up's response through the network.

Apart from the 3 db. rise at 3000 cps, the response falls within 2 db. of the zero reference line from 40 cps to the pickup's cut-off frequency at 14,000 cps.

LOWER IMPEDANCE

Curve "E" is very similar in shape and shows the performance through a much lower impedance filter, along lines suggested by ourselves last month.

As before, the .035 meg. resistor represents the total resistance from grid to earth. It can be an actual resistor of that value in the control unit or it could be made up by connecting an external 0.1 meg. resistor in parallel with the usual "built in" .05 meg. grid resistor.

The main difference between the filters is not so much in the ultimate response as it is in output. From filter "D", as suggested by the pick-up manufacturers for the "Leak" amplifier, the nominal output from a 1 Kc. test track at 33 rpm is 14 millivolts RMS.

This is equivalent to about 20 millivolts peak — the value which must be allowed for when reckoning grid drive.

From observation, maximum signal amplitudes are likely to exceed

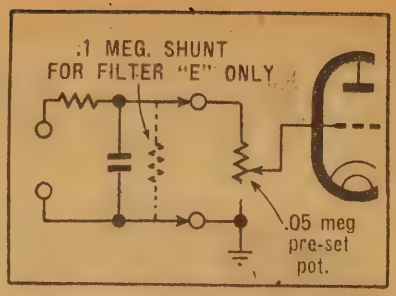


Figure 4. To prevent overloading the input stage of compensated amplifiers, a pre-set volume control is a commendable scheme. Once set, it need not be touched during ordinary usage.

the nominal test track output by almost 10 times, which therefore raises the absolute peak output from the pickup and filter "D" to 0.2 volt.

While this will be ample for sensitive amplifiers, it may give the impression of inadequate reserve of gain for quiet records and amplifiers of "in-between" sensitivity.

Filter "E", as shown, easily overcomes this difficulty by making available a much higher signal level, nearly five times the figure just quoted. In point of fact, this may be too much for most amplifiers of the "Playmaster" type. The obvious danger is that signal peaks will overload the input grid and lead to distortion, which is not eliminated by the volume control in the second stage.

A scheme which has much to recommend it involves installing a .05 meg potentiometer in the first circuit, shunted if necessary, to further reduce its value. The grid is connected to the moving arm and the potentiometer preset to avoid danger of overloading, while retaining normal operation of the main volume control.

Of course, the same effect can be obtained by substituting two resistors in series for the .035 meg. unit, proportioning their values so that the right termination is retained for the filter, while suitably tapping down the signal for the grid. This is a matter for personal choice.

As indicated by figure 3, the same two filters are applicable to the 78 rpm heads and the curve shows the same general contours as already shown by curve C in figure 1.

While the effect of the two filters is very similar in the treble region there is a curious discrepancy in the bass register. While our own low impedance filter is fairly consistent in its effect on the microgroove and standard heads, that suggested by the manufacturer shows a marked over-correction in the bass end.

PICKUP DIFFERENCES?

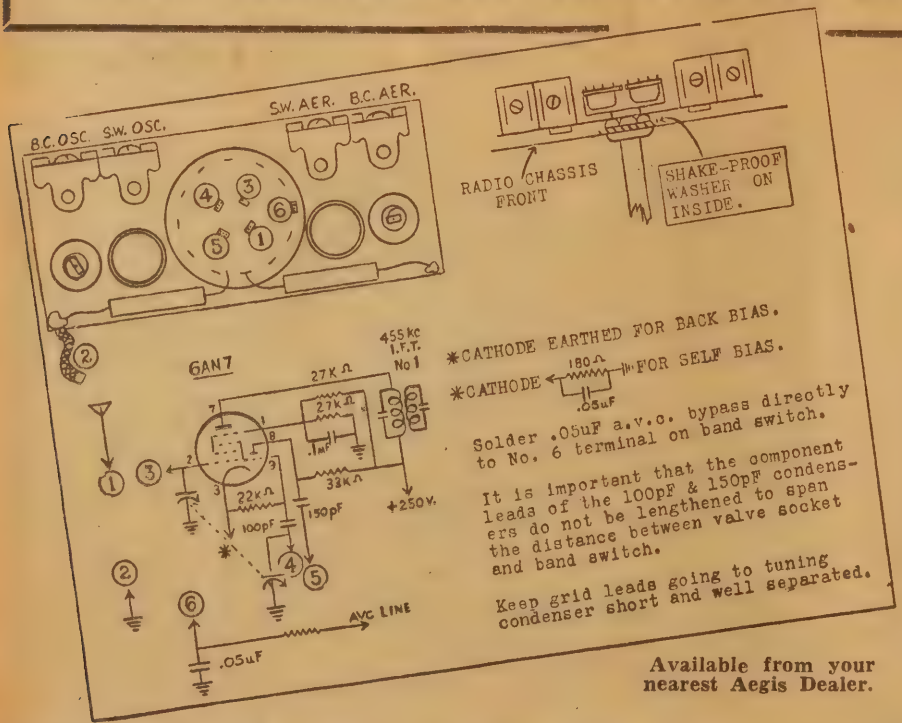
This is probably accounted for by the sensitivity of the high impedance network to variations in pickup head characteristic.

It would appear to be a definite factor in favor of filter "E" and its corresponding curves.

A peak at 3Kc appears in all curves and, while it is of no great consequence, we investigated the possibility of tuning it out by modifying the filter originally specified for the GP-20.

Unfortunately, we found ourselves up against the familiar problems of

THE AEGIS DUAL-WAVE COIL UNIT



TYPE K.I.M. Here is another brilliant little performer from the tried and tested Aegis range of radio components. This unit has been designed for simplicity, efficiency and minimum space requirement, ALL to save you money! Like all Aegis Products this unit has been thoroughly factory-tested for sensitivity after alignment, therefore very little realignment should be necessary in your receiver. The Short Wave 16-50 metre band was chosen for best performance and maximum entertainment.

For best results we suggest you use the MIDGET AWA (M.S.P.) 2-gang TUNING CONDENSER and converter, type 6AN7 or 6AE8, with the AEGIS Dual-Wave Coil Unit, Type K.I.M. (illustrated circuit opposite).

Retails at ... **55/-** plus tax

Available from your nearest Aegis Dealer.

AEGIS MFG. CO. PTY. LTD., 208 LT. LONSDALE ST., MELB. FB3731

recting one fault and inserting other. In the end, we reckoned game not worth the candle and led for the simplier approach.

The final question is probably quite obvious one. "Having a GP-20 filter already on hand, should crap it and buy a GP-39 cartridge cartridges)?"

If your present cartridges have yed a lot of records, it's about ne you scrapped the stylus anyway, so that portion of the cost ll be automatically offset.

If you've been using the GP-20 thout compensation, and straight o a conventional pot. and amfier, the new cartridge will probly sound smoother to you, due to e absence of the 6Kc peak.

If your GP-20 is fully equalised d has a good stylus, the difference ll not be so noticeable on most cords. However, if the manufacrer's claims mean anything at all should play heavily modulated ooves in the latest records without idue distress and distortion. But s up to you and your pocketbook.

REPORT ON TELEVISION

(Continued from Page 5)

er of regulating factors, it also iggested that a code of operating andards should be drawn up by ie commercials similar to that exist-g for broadcasting. This can be garded as a foregone conclusion. he commercials in their own inrests have every reason to make ieir programs attractive and free om objectionable matter. Nor ould there be any doubt as to their bility to do this.

The Commission further recomended that there should be full o-operation between national and ommercial stations to provide a omplementary service. This is a ery wise advice, as with so few hannels it would be intolerable, or instance, if all stations serving ne area concentrated on the same orse race, or arranged their talks nd demonstrations at the same ime.

If the implied duty to the public which the Commission obviously egards as being paramount is to nean anything, then we must avoid what too often happens in broadasting today.

NATIONAL EVENTS

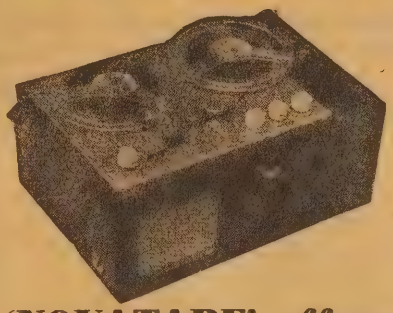
The Commission goes still further nd stipulates that in an area where nly one commercial station is operting, the national stations should nake programs of national interst available to it. This would not void the fatal isolation which could e the lot of a pioneer station not able to command the facilities to ring such programs to those who an receive no other.

There will undoubtedly be technical problems involved if this provision is adopted, but then TV is oristling with such, and they are nly there to be overcome. No one pretends that all its angles will e easy or inexpensive.

An ancient English gold coin was known as a "noble" because of the good quality of its gold. They were originally given as a reward for good news, or important service done. They were first minted by Edward III.

'NOVA'

NOVA



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Far from being a matter of guesswork, the output voltage of AC power supplies can be worked out accurately long before you put soldering iron to solder. Similarly, you can work out the voltage of the power transformer if you know the high tension voltage. Next time you have need of a power supply for an amplifier or receiver, work out all the component values beforehand.

A PROBLEM which came up in our laboratory a couple of weeks ago is typical and shows how available data can be put to good use.

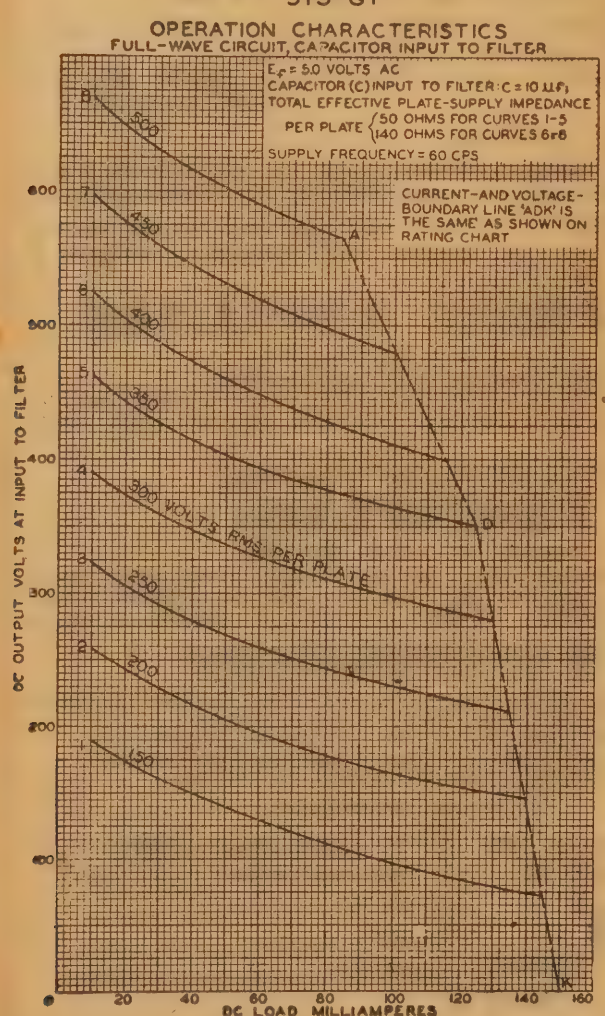
A power supply was required for a push-pull 6V6-GT amplifier. Previous checks had shown that the total current drain would be 110 mA when the rated 262 volts high tension was applied. (This was made up by 250 volts high tension plus 12 volts for bias.)

Several 5Y3-GT's were on hand and we decided to use this type if possible.

Accordingly, we consulted the manufacturer's information on the 5Y3-GT. The particular page in which we were mainly interested is reproduced here.

The curves refer to the DC voltage at the input to the filter so that allowance had to be made for the resistance of the filter choke. Filter chokes to carry 110mA (125 mA rating) can be obtained in several brands, each with a different resistance. The average would be about 100 ohms and we made our first calculation with this figure as a basis.

Taking the current drain as 110 mA, the voltage drop across the choke was calculated to be 11 volts. Adding this to the 262 volts high tension gave 273 volts for the voltage at the input to the filter.



Looking at the graph you will note that the vertical scale is marked off in volts and the horizontal scale in milliamps. Draw a light pencil line across the graph at the 273 volt level (near enough to 275 volts) and a vertical line at 110 milliamperes. Note the position at which these lines intersect.

The solid curved lines across the graph are drawn, each for a particular transformer voltage. You will see that the particular point in which we are interested falls between the curve for a 300 volt transformer and the curve for a 250 volt transformer.

At this stage you could probably take a fairly accurate guess at the required transformer voltage but for the sake of good order we will work it out.

There are 13 small divisions between the 250 volt curve and the 300 volt curve. The intersection of the two pencil lines is 10 divisions up from the 250 volt curve. Therefore the transformer should deliver 250 plus 10/13 times 50 volts. This works out at 250 plus 38 or 288 volts.

STANDARD TRANSFORMER

This is very close to the standard value and we decided to use a standard 285 volt 125 mA transformer. On the basis of the 100 ohm choke the high tension voltage would have been a few volts lower than optimum. One particular brand of choke happened to have a resistance of 75 ohms and we decided to use it in order to take advantage of the extra couple of volts. A small point, but it happened to be as easy to use one as the other.

Had the transformer voltage worked out to some odd value the simplest procedure may have been to use the next higher standard transformer and reduce the voltage by inserting a dropping resistor in series with the filter choke.

There will be cases, of course, when it will be worth while considering other rectifiers which, by virtue of their different internal impedances, will deliver different output voltages.

There will be occasions when you will have a transformer on hand and wish to work out the high tension voltage. The chances are that the transformer voltage will not correspond to any given curve but it is a simple matter to pencil in the required curve in the correct position as all the curves are very nearly the same shape. A 325 volt curve, for example, would go half way between the 300 volt and the 350 volt curves.

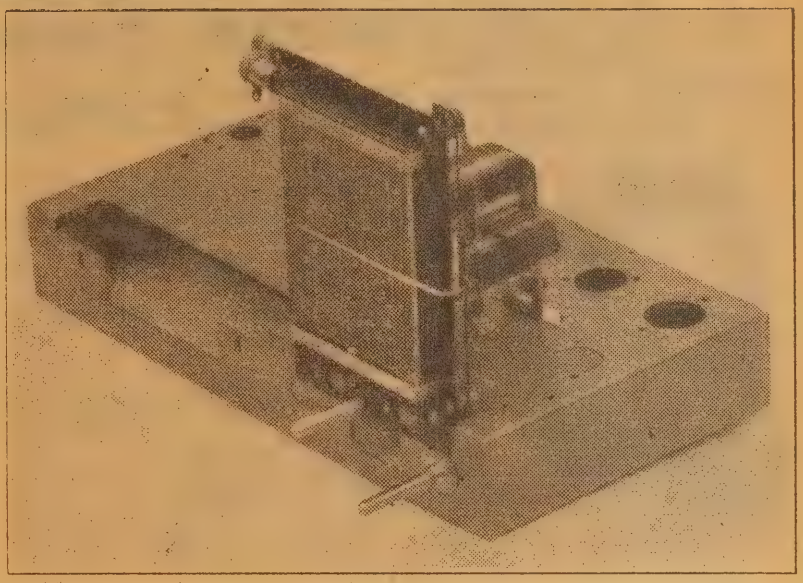
A typical rectifier curve from a valve manufacturer's data book. Similar data is available for choke input filter in the case of all the popular rectifier types. When used with ordinary care, the curves allow the operation of power supplies to be predicted with accuracy better than needed for most design purposes.

OTHER CURVES

Manufacturers also publish curves for rectifier valves used with choke input filter and most of the above remarks apply. If you examine the two sets of curves side by side, you will note that for a given transformer voltage, the output voltage of the rectifier is lower with a choke input filter. However, the output voltage does not change a great deal with change in current. For this reason, choke input filters are frequently used in supplies for class AB2 or class B amplifiers which require good regulation.

DIAL MOUNTING ON "FIRESIDE 5"

Due to a change in design of the SLV-21 dial, some confusion has arisen concerning its use with the "New Fireside Five" and the "Long Range Five" receivers, as described in the January and March issues, this year.



This photograph shows how the new type SLV-21 dial can be fitted to the existing chassis, as originally specified for the "New Fireside Five" and the "Long Range Five". The blueprints for both chassis have since been modified and will incorporate the slight changes shown below.

THE original chassis plan was based on the use of the earlier type dial, which had a larger back plate and a different method of suspending the pointer.

This allowed certain modifications to be made, as detailed in the original articles, which were aimed at keeping all three spindles in line. Unfortunately, these instructions do not hold when referred to the later type dial, which has a smaller back plate and a different method of suspension for the travelling pointer.

A further difficulty is that the lower cord pulley now tends to foul the chassis and also comes very close to the body of the control immediately beneath it.

CHASSIS CHANGES

These notes are intended to assist those who may have to mate a new type dial with one of the original chassis. Our blueprints have since been modified, so that new chasses will incorporate the suggested amendments to bring them right up to date.

As the accompanying sketch shows, the corner of the present cutout must be enlarged by a small amount to clear the cord pulley on the new dial. Fortunately, this is not a very difficult job.

Scribe the outline of the new cutout on the chassis and drill a series of holes just inside it, edge to edge. Then, with the point of a medium-sized screwdriver, break away the metal between the holes and finally pull the piece away with a pair of pliers.

The more holes you drill in the first place, the less chance there will be of distorting the chassis. Finally, file back the jagged edges to the scribed lines and cover the raw metal edge with a tiny dab of lacquer.

The miniature AWA gang can then be mounted in its original position, with the feet holding it well above the chassis, as shown in the photograph. No changes need be made here.

DIAL SPINDLE

Before you go any further, it is necessary to decide just where you want the tuning dial spindle to fall. In any case it must be moved from the side position, for which the dial is normally strung, to a position which will be central between the tone and volume control knobs.

The simplest procedure is merely to move the spindle across to the centre position on the dial plate so that the knobs will form a triangular pattern instead of being in line, on the front of the cabinet.

To do this, you may have to retie the knots inside the drum to give a slightly longer run of cord.

It will leave two 1-8th inch holes on the outer edge of the plate, which can be used to lock the dial plate to the chassis.

Before you drill these mounting holes in the chassis, screw the potentiometer in place and make sure that the cord pulley just clears it. If the pointer rail is set too low, you can slacken the holding bolts and slide it bodily upward. Alternatively, the bottom can be filed away a little.

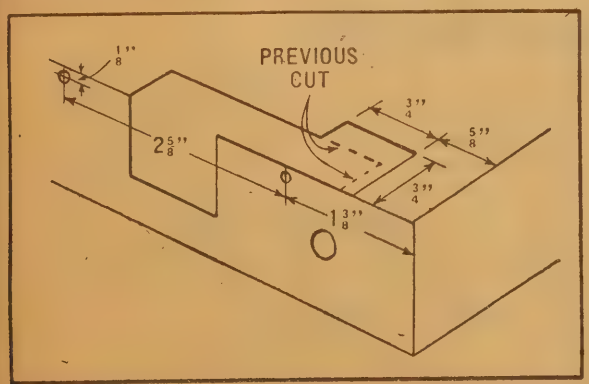
If you watch this point carefully and do not use too large a control, everything will clear nicely, and the dial scale will occupy the position originally intended on the face of the cabinet.

METAL PLATE

For those who may wish to keep the spindles in line, it can be done by fitting a metal plate across the front dial cutout and drilling the necessary holes to accommodate the spindle bracket.

This, of course, will require the removal of the bracket from its designed position on the dial backplate to a much lower position on the false plate, and, therefore, necessitates the changing of the present dial cord for a longer piece.

Before attempting to change the cord, make sure that you are familiar with the operation of the dial drive—perhaps a small point, but one well worth mentioning if it should save someone from becoming involved in a hopeless jumble, trying to reassemble the bits and pieces.



If the dial cutout on the two chassis are enlarged, as shown, there will be sufficient clearance for the lower cord pulley on the new dial. The plate must be set high enough, however, to clear the potentiometer.

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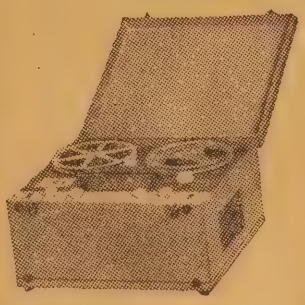

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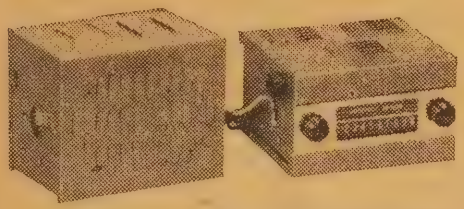

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OFF THE RECORD — NEWS & REVIEWS

The emergence of Beethoven's Ninth Symphony as something of a best seller overseas has been one of LP's surprises. One would have imagined that this complex and controversial work would have been too much for the type of listener who buys on a big scale. The fact is that there must be more than a dozen versions selling on discs at the moment.

By JOHN MOYLE

IT is a most difficult work to perform well, and apart from rare appearances on Australian programs, few have had opportunities for close acquaintance. What 78 versions there were suffered from the need for frequent changes, and the ruination of concentration.

It is equally difficult to record, particularly the last movement. Some maintain that it is impossible to sing well because of its outrageous vocal demands, particularly on sopranos. It may even be that it is still too hard for our recording processes to handle wtihout disaster.

BEETHOVEN—Symphony No. 9 (Choral); Symphony No. 1 in C major. Played by the NBC Symphony Orchestra, conducted by Arturo Toscanini. HMV ALP 1040.

Before his retirement, Toscanini made many records both in England and America. Among these, the Ninth Symphony was scheduled to be something right out of the box. With the NBC orchestra, its famous conductor, and a chosen choir and soloists, RCA-Victor cleaned up its tapeheads and got to work.

What was left of the performance after everyone had finished with it we can now hear on the records recently released in Australia. In general, that is my impression after having played it half a dozen times, and comparing it with as many other versions as I could find.

REMORSELESS DRIVE

I don't mean that there is nothing left worth listening to—that would be quite wrong. But I feel that the recording has been "through the mill". Its remorseless drive is made continually obvious by lack of breadth in the audio, and there are sections, particularly in the last movement, where I suspect filters and gain controls have been used to iron out those difficult passages which have been the downfall of almost every version I've heard to date. The traces of the musical workshop seem more than a little evident, and it's a matter of opinion whether you will like the result.

The first movement comes off best. The second is commendably free from musical woolgathering so often heard, but is rather too strictly dealt with. The scherzo has great vitality and wastes no time—in places it virtually guffaws. The last movement I liked least, nor did the soloist impress me as a successful team.

This is a long symphony, and contains so much material and such a wide range of material treatment that it is extremely hard to keep its general shape cohesively in mind, even when you know it well. Toscanini helps us probably more than anyone else, and his firm handling is the reason. Not for a beat does he allow the music to play itself, as so many others do, only to lose their way in a maze of meandering. He is in charge, and in innumerable phrases and shades we are forced to recognise it.

But at the end we rather feel as though someone has done us a violence, exhausted by music literally aimed at us for a solid hour.

Much of this is probably due to the recording. Like so many NBC records it is dry—there isn't enough reverberation to keep the music alive. It sounds well, and at times beautifully, but too often the sound just dies in its tracks. In a concert hall the performance would probably have been magnificent. But I look at it as a recording, and must judge it as such.

DIFFICULT JOB

I doubt whether there is a really satisfactory recording of the final movement, and this one falls short in its own way. It is supposed to be a Hymn of Joy, but it didn't make me joyful. I felt no thrill at the great climax—the reproduction appeared to have been pared away until only a shadow remained.

The finale which has impressed me most of all is Westminster's which unfortunately is extremely difficult to play cleanly. Its cymbals really crash. The weight of the orchestra is felt in that series of tremendous chords which would lift anyone from his seat. Toscanini's version is easier to play, but it sounds tame by comparison.

Summarising, therefore, this is a mighty effort, and one which should sound best on average quality equipment. Lovers of Toscanini will love it, for it is imprinted with his stamp and his philosophy. But it does not represent the last word on the Ninth.

The fourth side contains a most successful recording of the First Symphony, identical in general character with the Toscanini we already know, and with no surprises. Dynamic and frequency ranges are not high, but it is good listening.

HAYDN—Symphony No. 83; Symphony No. 96. Played by the Halle Orchestra conducted by Sir John Barbirolli. HMV ALP 1038.

This is a very fine example of Haydn, and one I feel sure will delight you from start to finish. I played it immediately after hearing some heavy-weight stuff, mad with brass and drums, and my first impression was of the clear outline Barbirol has achieved with such a deft touc It seemed rather thin for a start, b the somewhat remote recording sui the music, and the reverberation balanced without spoiling the sharp ness of its shape and outline.

The orchestra plays throughou with admirable flexibility, a read response to light and shade, an absolute precision without which a these things would be thrown awa

USE OF DYNAMICS

This light and shade is obtaine almost purely through dynamic rather than tempo. Once the beat ha been set for each movement, Bar birolli maintains it without flaggin or raggedness, and although it i mostly on the fast side, there is n sense of hurry. The players handle i with vitality which makes the musi sparkle.

The frequency range is quit good, although the microphone place ment does not favor a great deal o bass or treble development. Th strings have an appropriate edge, bu are always clean, and each section i readily recognisable through its ow characteristic timbre.

Surface noise was non-existent o the disc I heard, which allowed th maximum effect to be obtained fron the wide dynamic range. The quiet est passage was unspoiled by an disturbances, mechanical or other wise.

I am sure you will like this record and if you want this vigorous branc of Haydn you should not miss it.

MOZART — Quartet No. 8 in F Major (K168). Quartet No. 17 in B flat Major (K458)—"The Hunt" Quartet. Played by the Griller String Quartet. Decca LXT 2728.

This record was a strange disappointment to me — strange because knowing what the Griller can do, I was hoping for a really outstanding version of the beautiful "Hunt" quartet.

Unfortunately the players brushed off the music at such a terrific rate that I thought for a moment I had the turntable stuck on the wrong speed. Let's have vitality by all means, but let us at all costs hear the music. Here it sounds more like a high speed production job. Even allowing for the fact that some might like it played that way, it left me with the impression of a tuneful gabble.

The third movement, an exquisite Adagio, is by far the best. Even the Griller in its diabolical mood of the moment was forced to pause here, although it seemed as though the players were impatient to get going again, and missed the essential timelessness of this lovely music. And so they were, for they finished, fortun-

tely together, but way ahead of Mozart.

Otherwise the record isn't at all bad. The recording is a little light on the bass and does more than justice to the first violin, but it's quite forward and clean almost to the last bar. The surface is fairly quiet, but there is a slight hum from the recording tape which can be heard on a good machine.

The No. 8 Quartet suffers more considerate treatment, and it needs it — it is an early work, and not of the same maturity or quality of the "Hunt".

BEETHOVEN — Piano Concerto No. 5 in E flat Major (The Emperor), played by Edwin Fischer and the Philharmonic Orchestra conducted by Wilhelm Furtwangler. HMV ALP 1051.

This is probably as good a recording of the Emperor as I have yet heard on LP, but it isn't yet that outstanding release which I feel must be around the corner somewhere. It is a safe, standard performance which should sound quite well on almost any gramophone. It is recorded without any appreciable reverbration, with the orchestra and pianist well to the fore and has neither strong bass or treble, but plenty of good, ripe, middle tone.

It suffers as a result from some imbalance, not only between the soloist and orchestra, but between the players themselves. If you are critical, I fear you will hear passages where there isn't enough fellow feeling between them.

All these things, however, don't make it a bad recording. They are simply my idea of why I couldn't give it full marks, even though I think it rates quite high among its contemporaries. There is nothing which could offend any listener in its general shape and tempo, and plenty which will please.

It played quite cleanly even on wide range equipment, although as I have said its modest complement of highs help a good deal here. The surface, too, is quite good.

SCHUBERT — Quintet in C Major Op. 163. Played by the Amadeus String Quartet with William Pleeth (second 'cello). HMV CLP 1006.

This is a record which I would like to praise. The quartet, as shown by the picture on the record cover, is composed of earnest young men who have tried very hard to give us a worthy performance. Of their sincerity there can be no doubt, but it takes more than this to cope with such a monumental work. Because it is monumental, with a haunting loveliness which cannot fail to move all who hear it.

I am inclined to blame the recording for much of its failure to impress. This is music in which complete cohesion and balance is completely essential. The addition of the second cello no doubt makes it a little more difficult to handle as an ensemble, but at any rate the balance between instruments is not first class.

There is also a lack of reverberation, a little of which would have done a great deal to hold the players together. As it is, a tendency for the second violin and viola to fiddle away in the background is made the more noticeable. In the second movement, where pizzicato is so freely used, I felt that the recording engineers could have helped. A little closer microphone placing and practice by the players for its benefit could I think have avoided that dull, tubby sound which is certainly not what Schubert intended.

The second and third movements are perhaps the most successful but more experience and maturity seem to be needed.

KHACHATURIAN—Concerto for Piano and Orchestra. Played by Moura Lympany and the London Philharmonic Orchestra, conducted by Anatole Fistoulari. Decca LXT 2767.

This concerto was the subject of much interest and discussion when William Kapell first played it here in 1945. Later on he made a recording remarkable for its brilliance and fire.

But it is more than a mixture of rhythms and flamboyancy. It has almost classical form, strong arresting melody, and brilliant orchestration. The piano part is exceedingly difficult and complex—its demands are physically and mentally severe. It is one of the most important and competent works of its kind to come from modern Russia.

Thematically it is based on folk music, so expertly exploited that the music achieves a haunting beauty quite unique. Particularly is this true of the second movement, in which a simple lyrical theme of a few notes compass is woven into a really beautiful pattern of orchestral rhythms and color.

This movement introduces the flexatone, which is much the same kind of thing you played with at school. Yet it has a quality which makes it just right. Although a celeste could have been used instead, it would have lacked that ethereal quality the composer was seeking.

Technically, this is a remarkably good record. Moura Lympany, who introduced the concerto to England, handles the whole thing firmly, with full tone and clean technique. She hasn't the precision or power of Kapell, but the recording is so much better than the older 78's that there is little basis for true comparison either in balance or adequacy. But somehow this concerto seemed so much made for Kapell!

The orchestra gets full marks for its work, and for the wide range of its recording. The piano, too,

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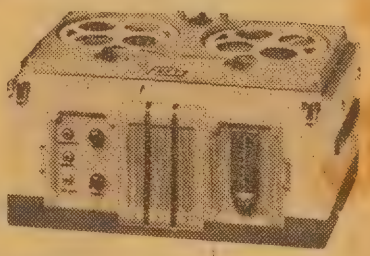

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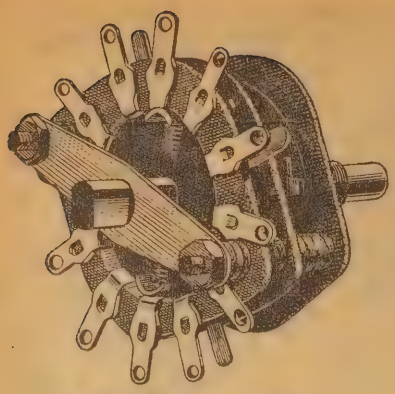

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sounds most convincing. There may be a little blurring on wide range equipment at full volume, but with everything right it should be OK.

Altogether, an unusual and most successful record.

HANDEL—Six Sonatas for Violin and Harpsichord, Opus I (Nos. 1, 10, 12, 13, 14 and 15), played by Alfredo Campoli (Violin) and George Malcolm (Harpsichord). Decca LXT 2751.

The Opus 1 doesn't mean that this was Handel's first work—it relates only to the order of publication. There is nothing juvenile about them. Several are frequently heard, although not often with the harpsichord. They are from a set of fifteen written for violin, flute and oboe.

There is a great deal of music on this record, for, although the sonatas are not long, they are all works of four, standardised movements. Campoli plays them admirably, and is as admirably recorded. Noteworthy are his accurate intonation, firm outline, and sensitive response to the mood of the music.

He bows cleanly and with authority. He would need to, for the slightest fall from grace would be exposed with deadly accuracy. The care taken with each movement may be the cause for variations in the balance between violin and harpsichord which are noticed occasionally. It would, in fact, be remarkable if this were not the case, as the recording session must have taken some time.

The harpsichord is restrained in its quiet tone, and is kept rather too far into the background. There are times when its quite important contribution is almost inaudible. But for all that, this is a splendidly recorded and thoroughly musicianly disc.

WAGNER — Orchestral highlights from Siegfried, Gotterdammerung and Parsifal. Played by the Munich State Opera Orchestra conducted by Franz Konwitchiny. Nixa ULP 9065.

A high standard of performance and recording is achieved in this disc which includes some of Wagner's best music for those who aren't able or prepared to invest in large, complete works. Although any records of excerpts tend to sound a bit patchy, there is a case for grouping some of the more popular sections on or record.

The Parsifal, at any rate, doesn lose anything by the treatment, both the Prelude and Good Frida Music are themselves interlude Siegfried does appear a bit mo disconnected treated this way.

Orchestrally, balance and cohesio are very good indeed, and there some particularly convincing bra which sounds the real thing on wid range equipment. This is a re Wagnerian performance, a little r mote, but lacking nothing in its sen of bigness and weight. The surfa is good and it plays cleanly.

HINDEMITH — Mathis the Pain er. Played by the Berlin Philhar monic Orchestra conducted by Pa Hindemith. Radiola - Telefunke LB6002.

This record must command special respect for, being conducte by the composer, we must accept for its authenticity, and Hindemith i quite a significant figure among pre sent day musicians. I found it rathe lacking in weight and force, for whic the rather dead studio must tak some blame. Its outlines are ver clear, and possibly we are incline to look for "show pieces" on occasion such as these.

The surface isn't dead quiet but i isn't really a hazard. Frequenc range is fairly good.

SMETANA — "Moldau," "Fron Bohemia's Meadows and Forests." Played by the Bamberg Symphony Orchestra conducted by Joseph Keil berth. Radiola-Telefunken LB6014.

Two beautifully played excerpt from Smetana's lovely symphonic cycle in which the clean, well-defined recording does full justice t the color and instrumental interplay of the orchestra. Violin tone is perhaps a little thinly etched at times but this isn't out of place and make a delicate foil for the brass and woodwind.

This is the first record I remember of the Bamberg orchestra but its quality makes me hope it won't be the last. A little extra hum apparently from the surface will probably not bother you.

Frequency range is fairly wide and surface smooth. A record wel worth hearing.

BEETHOVEN — Symphony No. in C Minor Opus 67. Played by the Concertgebouw Orchestra of Amsterdam, conducted by Willem Mengelberg. Radiola-Telefunken LSK-7005.

A very good performance of the Fifth in the truly grand manner with plenty of honest power and weight. Its signature lies in the deliberate sounding of the first four notes which are generally played much more quickly. But if they are in fact "Fate knocking at the door" then it's reasonable to expect a dignified and solemn summons rather than an impatient battering of one's portals.

In the slow movement, I was pleasantly surprised by a comparatively brisk tempo which gave no trace of drag.

The scherzo is played perhaps a little too briskly, but its nicely brought out drum beats are prelude to a magnificent final movement in which, however, there are one or two changes in pace somewhat reminiscent of hauling in a racehorse in full flight. The first chord of the

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last movement is held back by the recording engineer obviously apprehensive of disaster. But these are minor matters in a really impressive performance.

The recording is a little rugged, but if it lacks some smoothness it has the right power and weight and that's the way I like the mighty Fifth. It was made some years ago for the conductor is now dead.

CESAR FRANCK. — Prelude, Chorale and Fugue—Prelude, Araia and Fugue. Played by Joerg Demus (piano). Westminster WL 5163.

This is a very good example of piano recording—one of the best heard for many a day. It is well worth listening into to see how the usual piano pitfalls have been avoided. As most people realise, it is a most difficult instrument to handle, for its percussive nature holds pitfalls for the engineer up to the moment the actual disc is pressed.

As with so much of Franck's music, it is in reflective mood, and has fewer than normal powerful passages.

But fortunately only the last few grooves can seriously be questioned and then only on wide range gear.

The instrumental realism is first rate. The microphone setting catches the real character of the bass strings, without losing balance in the upper register. It comes very near "bringing the instrument into the room".

The performance, too, is fine. The pianist, who is not yet 30, shows real muscianship and understanding of the music which as any pianist knows will test his ability to control his tone and handle Franck's scholarly but somewhat prolix musical thoughts. The surface noise is negligible, and inaudible at average room volume.

SCHUBERT. — Rosemunde Music (complete). Played by the Vienna State Opera Orchestra conducted by Dean Dixon with Hilde Roesselmeicher directed by Ferdinand Crossman. Westminster WL 5182.

The complete music for Rosamunde is rarely heard which is a pity, and the original story for which the music was written has virtually disappeared, which most agree is a good thing. Portions of the music such as the Entre-Acts and the Ballet music are well known to any music lover.

They are all on this record together with vocal sections not so familiar.

The music in fact presents an exceedingly interesting cross section of Schubert's work, both orchestral and vocal, and some of the material, as was his habit, appears elsewhere in other compositions. Strangely enough it does not sound unduly disconnected and the wide variety of mood provides some unexpected and effective contrasts.

Th orchestra deserves a special word for its clarity, sensitivity and restraint. Particularly good are the brass and wood-wind. One rarely hears the quiet mood of music so well recorded, for over most of the surface there is complete absence of noise. Only for a minute or two at the end of each side could one seriously question the quality and then only for wide range.

Definitely one to hear.

RECORD NEWS FROM ABROAD

At last one of the record companies has brought out an LP with a second side which should suit everyone — it's blank. No music at all.

THIS happy situation has come about with the fierce competition which has developed in both England and America to sell Cavalleria Rusticana to the public in a way which will be money-saving to the consumer. You will possibly recall that EMI a few months back issued this opera as part of a three-disc set, with Pagliacci, each opera taking up three sides. Decca answered this with two 12in records, which were cheaper to the person who only wanted "Cavalleria", but which still involved filling up the fourth side, in their case, with a recital.

ANGEL RELEASE

Now, the EMI equivalent in USA, Angel Records, is selling a new recording, taking up three sides only, with nothing whatever on the fourth. As an added attraction, the price is about halfway between the price of a single disc and two discs. I believe that this approach will be welcomed, except, perhaps, by those who use an automatic record-changer. Just what will happen to the stylus when it hits the trade-mark impression on the blank side I shudder to think—someone, sooner or later, is bound to forget to switch off in time.

The particular recording is from La Scala, Milan, and is the first of many from EMI, who are just beginning a two-year contract on La Scala performances.

Records from England are few this month. The only new Decca is from Sir Adrian Boult and the London Philharmonic, with Vaughan Williams "JOB". The Ansermet "Pictures" which was noted a few months ago has apparently been held up, and is just available.

EMI have no new LPs for June, although both HMV and Columbia are advertising their EP-45's furiously (did you notice the price reduction on Decca Medium-Play here last month?).

MERCURY IN UK

An important new label is now officially released in England. American Mercury have been represented after a fashion by Oriole Records, of London, but only in the 78 field.

Oriole have now begun selling Mercury on all speeds, with music right down the scale. Their classical list so far consists of extracts from their "Olympian" series, from which EMI took over the Pictures and the New World Symphony, to mention just two. Items on sale to date include:

Spirituals for String Choir and Orchestra, by Morton Gould (that title is not a misprint), with Gershwin's Porgy and Bess is a first-rate performance and recording. Others are the Mendelssohn Italian Symphony, with the Mozart No. 40—Minneapolis Orchestra, and Dorati — Scheherezade, Fountains and Pines of Rome, the Tschaikowsky 5th, and sundry other war-horses. Latest American additions to the series are Stravinsky's Rite of Spring, the Russian Festival Overture and 2nd Symphony of Rimsky-Korsakov, and music by contemporary American composers. There are 30 LPs in the Mercury Olympian Series. All are noted for their brilliant sound. The rest of their catalogue is of indifferent quality, both musically and technically. Catalogue numbers to watch for are MG50000—MG50030, assuming that they are not renumbered for local releases.

FROM RCA VICTOR

A number of new releases have come from RCA Victor, among them being Mozart Concertos 12 and 18 by Lili Kraus and the Boston Symphony, a disc of ten items by Menuhin, Bach's St. Matthew Passion, by the Toronto Symphony and Choir, and Mahler's 9th Symphony by Bruno Walter and the Vienna Phil. Although Toscanini's retirement has already taken place, there will be a number of discs still to come. Already issued are Mozart's Symphony No. 40, the Haydn Surprise, Dvorak's New World, and scheduled for later in the year are Verdi's Requiem, Schubert's C Major Symphony, and the recorded broadcast performance of Falstaff.

Those of you who have been following Decca's Backhaus recordings may be interested to know that he has now completed the 32 Sonatas and five Concertos by Beethoven, and the two Brahms Concertos. Westminster's Hermann Scherchen has had more heavy recording sessions in London, this time with Tschaikowsky's Romeo and Juliet, 1812 Overture, and Marche Slave, and Berlioz Symphonie Fantastique mentioned last month. Given a good pressing, Westminster's sound can be of excellent quality, as English buyers are now discovering. With Mercury also in the market for Hi Fi, and Philips just around the corner with the US Columbia issues, the prospects for future months is encouraging.

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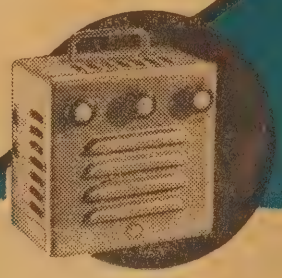

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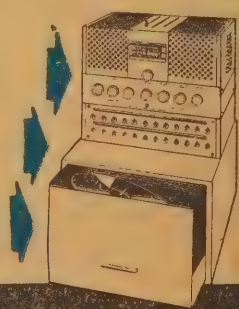

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SOME THOUGHTS ON ENCLOSURES

The vented enclosure has proved a most useful and convenient method of speaker baffling for many years. It is intended to compensate for loudspeaker resonance which otherwise would introduce an objectionable bass peak. What happens when the speaker is fed from an amplifier having large amounts of feedback and therefore a high damping factor?

THE reason we can't just stand a speaker on a table and expect to sound well is that we wouldn't ear any bass notes.

The speaker cone is an air pump, hich sets up pressure waves roughout the room for us to hear.

At low frequencies the cone moves mparatively slowly backward and rward, building up pressure in one irection and lowering it in the pposite direction as it oscillates to nd fro.

Without some kind of baffle, the r pressure, instead of making ound waves through the room, ould simply leak round the outde edge of the speaker from front rear and vice versa. The cone ould move all right, but we'd hear o bass.

Another characteristic of the peaker, which is important at low equencies is its natural resonance, he frequency at which the mass of he cone, stiffness of suspension and on will tend to make it move ore easily than at other frequenes. It is generally from 35-75 cles for 12-inch speakers.

If not removed, this resonance an cause undue prominence to all otes near its frequency, and spoil he smoothness of the bass response y inserting a prominent peak at hat point.

As a means of providing a good affle, and at the same time doing mething about this resonance efct, the vented enclosure was deeloped.

Without going into theory and urves at this moment, the enclosure is just a box with a speaker ounted inside, and a hole or vent ut somewhere, often a few inches elow the speaker, approximately he same area as the speaker cone self.

NCLOSURE DESIGN

The design of the enclosure is orked out so that it has a resonnce, because of its dimensions, corresponding with that of the loudpeaker itself. Because of this fact, he speaker finds it harder to deelop output in the box at this esonant frequency than at any ther. Thus, one resonance cancels ut the other, and excessive output the speaker's resonance is avoidd.

It doesn't work out as perfectly as that, of course, or as simply. or instance, where there would therwise have been a resonance eak, we might well find a slight rop in output, depending largely n the prominence of the speaker eak, the rigidity of the box and on. There should be theoretically two small humps on each side f the speaker resonance. The total urve, although somewhat lumpy, is much better looking and sounding ing than without the vented enosure.

So far so good. We have established that the vented enclosure is a good baffle, and is designed to cancel out the resonance of the speaker with which it is used.

What happens if we remove the resonance of the speaker? Obviously we will be left with the resonance of the enclosure which will now introduce a bass peak just as the speaker would have done on an open baffle.

So that with a speaker having no resonance, or used with a circuit which removes resonance, a vented enclosure would be the wrong thing to use.

Now a characteristic of modern amplifiers is their high degree of negative feedback, and the high degree of speaker damping it provides. A most valuable feature of this damping is that it virtually removes the effect of cone resonance from the speaker.

RESONANCE REMOVED

It does, too! When testing an amplifier recently I had a 12-inch speaker on the bench without a baffle, one which normally has a high cone resonance. Try as I might I could not detect any appreciable evidence of a resonant peak with feedback connected to the amplifier.

It can be fairly assumed, therefore, that when speakers are used with good amplifiers, speaker resonance is absent or at least will be very greatly reduced.

Isn't it strange, then, that designs are still published for use with modern loudspeakers, all of which are intended for use with high-grade amplifiers?

Such enclosures can only succeed in introducing bass peaks rather than suppressing them, for there should be nothing to suppress. No doubt this is why many have been disappointed with the performance of vented enclosures they have built according to the maker's instructions.

It explains, too, why I have found that big enclosures are always the best. Naturally, for a big enclosure is a good baffle. If it is resonant at about 30 cycles, this might even be a good thing, for most speakers begin to lose out in that region, anyhow.

In fact, I remember one writer on loudspeakers saying that big enclosures were to be preferred irrespective of design curves, and if we could make them as big as telephone booths so much the better. I wonder if he realised he was evaluating them merely as baffles and not as enclosures at all?

I must leave the matter here, but our irrepressible technical editor will not. I understand he has some trains of thought on speaker baffling which have been simmering for some time, and maybe he will take up the story in next month's issue. If what I have said is true, we are justified in overhauling our ideas.

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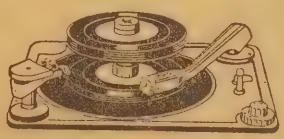

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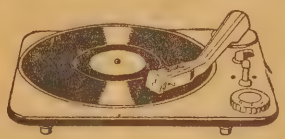

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SHORT-WAVE NOTES BY ART CUSHEN

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FREQUENCIES IN THE 75 AND 49 METRE BANDS

Japan's first commercal short-wave station is to commence operations on August 1st. Frequencies in the 75 and 49 metre bands are to be used.

OPERATED by the Nippon Short Wave Broadcasting Company, 13 Akasaka-shinsaka-cho, Tokio confirmed our reception of the test broadcasts which we reported in last issue. Though the station is to operate as JOZ on 3925Kc and JOZ2 on 6095Kc, the test broadcasts have been assigned the experimental calls, JJ2KY on 3925 Kc and JJ2KZ on 6095Kc.

The test transmission carried out with 500 watts, are heard daily from 11.0 am to 11.0 pm, and as only one transmitter is in operation, frequencies are used alternately. During July the transmitter JJ2KY (3925) will operate odd dates, i.e. July 1st, 3rd, &c., and the transmitter JJ2KZ (6095) on even dates, i.e. July 2nd, 4th, &c. The present power is 500 watts and the antenna system is a 90ft mast, with a single horizontal doublet.

POWER TO BE 5000W

Power will be stepped up to 5000W on August 1st, when the station is offically opened reports the President of the Nippon Short Wave Broadcasting Company, Mr Toshio Fukushima, when the calls will revert to JOZ and JOZ2. The antenna system will then be a series of horizontal antennas with reflectors, to cover Japan proper with maximum power radiated 250 deg and 10 deg from Tokio. The station will then be on full normal schedule which will be 8, am-midnight.

Further reports on the reception of the test broadcasts would be appreciated by the station. A verfication card, especially printed for the test broadcasts, is also sent to all listeners reporting reception. Signals are still being received at fair strength on 3925Kc but the 6095Kc outlet has some rather severe side interference from VL16.

BAGHDAD ON 3295Kc

Radio Baghdad, which for many years had been operating on 11724 and 7092Kc is broadcasting in late evening European service on the new 88 metre band frequency, 3295Kc. Radio Baghdad, which is a Government operated station in Baghdad, Iraq, uses the power of 16 000W o nthe short wave frequencies, while the broadcast band outlet, on 767Kc is listed as using 500W.

Radio Baghdad has news in Arabic at 5.00, which is followed by a musical program to 5.15 am. English announcements at this hour indicate that transmissions are on 11724 and 3295Kc and that the service is beamed to listeners in Europe. Popular orchestral numbers follow to 5.30 am when a news broadcast in English is presented for five minutes. Music continues to 6 am when the station closes with the Iraq National Anthem. English identification is not given very often, has been noted at 5.15, 5.30, 5.35, 5.45, and 6.00 am.

The frequency of 3295Kc is not listed as one officially assigned to the Iraqi station, the nearest channel is HNC on 3478Kc. The calls and frequencies assigned to the Iraq station are as follows: HNK (2300), HNB (2312), HNL (2400), HNC (3478), HND (4777), HNM (6135), HNE (6188), HNF (9683), HNG (11724), HNH (15145), HNI (17815). The frequencies of 7062 and 7092Kc have no callsigns allocated.

NIGERIA

Nigerian Broadcasting Service, at Lagos, is being received on 4800Kc at 6.00 am, when a relay of the BBC news is taken. Len Collett, Oamaru reports a verification from Lagos which gives the new schedule as follows:—

NATIONAL PROGRAM, Lagos 1600Kc, 300W. 3.00 pm-4.30 am. 7185Kc 20Kw, 4800Kc, 2500W, 9.30 pm-1.00 am, 4800Kc 20Kw 4.00 pm-10.00 am.

WEST REGIONAL, Ibadan. 5032Kc, 300W. 3.00 pm-4.30 am.

EAST REGIONAL, Enugu. 7079Kc, 300W later to be 2500W), 3.00 pm-4.30 am.

NORTH REGIONAL, Kaduna 3326Kc 7500W, 5.40-7.00 pm. 7175Kc, 300W, 2.00-4.00 am. 3326Kc, 300W, 6.00-9.00 am.

R.D.S. and Rediffusion stations relay the programs shown for their particular region, with, in some cases a proportion of purely local material. Changes in wavelengths are announced at the end of news bulletins. Reports are welcomed by the Chief Engineer, Broadcasting House in Lagos, Nigeria.

VENEZUELANS STRONG

SIGNALS from the Venezuelan stations which use mainly the 85 and 60 metre band are being well received in the broadcasts from 8.30 pm, while afternoon signals from the YV's are also good up to sign off from 1.30 pm onward. Several Colombian stations, the best being HJEF (4765) are strong in the afternoon, HJEF closing at 4 pm on Sunday.

A review of the best Venezuelan stations heard here over the past week are listed below, together with slogan, location and details on the broadcasts being received.

3340 YVMU, "Radio Carora" sign on 8.30 pm.

3350 YVKT, Caracas, "Radio Liberator" opens at 8.30 pm, aside interference from DZB2 (3345) Manila.

3400 YVKP, Caracas, "Radio Tropical" opens 8.30 pm, signal only weak.

NOTES from readers should be sent to Arthur Cushen, 212 Earn St., Invercargill, New Zealand. All times are Eastern Australian Standard Time.

3410 YVMK, Cabimas, "Radio Cabimas" sign on 8.30 pm with march, then news in Spanish, the strongest 85 metre signal.

3490 YVRA, Maturin, "Radio Monagas" sign on 8.30 pm but only fair.

4800 YVME, Maracaibo, "Ondas del Lago" sign off at 1.30 pm, when an English announcement is given, together with a request for a report from any listeners hearing the broadcasts. YVMO also heard at 9.30 pm.

4810 YVMG, Maracaibo, "Radio Popular" opens at 9.00 pm, also heard in the afternoons at 2.00 pm.

4880 YVKF, Caracas "Radio Ondas Populares" strong signal opening 8.30 pm.

4890 YVKB, Caracas, "Radiodifusora Venezuela" strong signal opening at 8.30 pm with news in Spanish.

4920 YVKR, Caracas "Radio Caracas" sign on 8.30 pm but some side interference from VLM4.

4940 YVMQ, Baraquisimeto "Radio Baraquisimeto" opens 8.30 pm, at good strength, also relayed by YVXJ (9510).

4970 YVLK, Caracas "Radio Rubos" opens at 8.30 pm, and on Sunday sign off is at 4.30 pm.

5030 YVKM, Caracas "Radio Contiente" strong signal from 8.30 pm.

5050 YVKD, Caracas, "Radio Cultura" good signal, some interference from the New Guinea transmitter on 5045Kc.

FLASHES FROM EVERYWHERE

OKINAWA'S Far East Network rel which has been heard for several ye on broadcast band, has been heard New Zealand at 4.00 am to fade out af 6.30 am on 4090Kc. The station rel the usual Far East Network programs the Okinawa station, but no reference made to the short wave frequency, ider fication is "This is the Far East Netwo Okinawa, 810 on your radio dial."

A transcribed session of recorded mus with identification each 30 minutes ma up the morning program, part of the night broadcasts of Okinawa, which broadcast band, operating on 24 hours day schedule. Verification from t station received by Len Collett, Oama NZ does not give any details on the sho wave station's power or schedule. Ve fication signed for a recent broadcast port was Walter J. Wolfe, Chief Engine Far East Network, AFRS, Okinav Ryukyu Islands.

VOICE OF AMERICA'S relay tra mitters in Okinawa, Salonika and Luz have each added additional transmitte Salonika, Greece operates four transm ters, the new ones being Salonika-3 (72 12.15-2.15, 3.45-8.00 am, and Salonik (7215) 2.00-8.00 am. The Okinawa stati the second at that relay base, opera as Okinawa-2 (7160) 8.00-3.00 am. T Luzon relay has its third transmitt Philippines-3 (11715) 7.30 am-10.00 am, 15105 midnight-3.00 am, 15245Kc 7.00-9 pm.

BUCHAREST'S second 49 metre ba frequency, 6145 Kc is putting in a go signal, when news in English is present 1.00-1.30 pm, and then repeated 2.30-3 pm, but the latter broadcast suffers fro some jamming. Bucharest operates 6145, 6215, 9250 and 9570 Kc for these broa casts which are beamed to listeners North America.

HAVANA'S latest addition to the shor wave field is COBX "Radio Alvarez" Cuba's capital, operating on 11900Kc. T station, which relays the broadcast ba station CMBX 1390Kc, has been heard Miss Sanderson, of Melbourne, for a fe moments after Radio Australia signs o on 11900Kc at 3.45 pm. COBX has be heard closing just before 4 pm, whe identification in English is given, inclu ing a request for reception reports co cerning the broadcast.

CAMBODIA'S new 10,000W transmitt located at Phnom-Penh, in Vietnar broadcasts on 6090Kc and in New Zealar is heard at good strength mixed wit VLI6 from 9.00 pm. Cambodia's fu schedule is 10.00-11.00 am, 3.00-5.00 pm 9.00-12.15 am, on 6090 Kc and 1433Kc broadcast band On Sundays the secon transmission is 2.45-8.00 pm reports Rad Australia. Canada's main privately ope ated short-wave station, CFRX operate by Rogers Radio, in Toronto, provid fair signals in Australia at 8.00 pm whe commencing the morning transmission 6070 Kc Toronto time, 6.00 am, the being on Daylight Saving Time.

URUGUAY'S 49M band stations, CXA on 6125Kc and CXA13, 6155Kc provid fair signals during the late mornin when the 49 metre band remains on durin the hours of daylight. The opening of th 49 metre band, with signals fro the main European stations and a fe South Americans, is the first time fo over 12 years that we have noted suc excellent signals on this band in the fore noon. Reports from Australia also in dicate that signals are good in tha area. CXA4 one of the SODRE chain ha been heard with commercial prograr and frequent identification shortly afte 11.00 am. CXA13 Radio Carve, on 6155K has news on the hour every hour in Span ish, and has been heard at best strengt with the session at 10.00 am.

LISBON'S broadcast on 6360Kc pro vides very good signals at 8.00 am i the transmission of the Home program The Overseas service, now carried o 11920Kc is heard at 8.30 am at very goo strength, with frequent identification a "Radio Nacional."

THE HAM BANDS WITH BILL MOORE

Amateur transmissions since the war have suffered serious interference from stations of other services. A considerable amount of this interference has been recorded in exclusively amateur frequency assignments and it is hoped that the jamming will lessen as the various nations fulfil the requirements of the Atlantic City frequency table.

HROUGHOUT the world considerable publicity is being given by amateur cieties to the continued and increasing tivity of commercial stations within the ıateur bands.

It has quite often been pointed out that me of our bands are shared with other rvices and are not exclusively amateur locations; 7100-7150 Kc/s being shared .th short wave broadcasting stations for stance.

The 3.5 Mc band is shared with fixed id mobile stations.

At the moment the commercial interrence level is recorded at its highest on e 3.5 and 7 Mc bands, due mainly to the crease in offending stations and the ırrent propagation conditions on these ırticular bands during the evenings.

Some improvement can perhaps be exected on the 7000-7100 Kc/s allocation hich is exclusively amateur, although a ımber of short-wave broadcasting ations have been appearing within these mits.

However some bands are reputedly exusively amateur and we can legitimely complain of the continued QRM of ther stations. The 28 Mc, 21 Mc and Mc bands are exclusively amateur with ıe exception of a small allocation on the igh frequency end of the 14 Mc band ıared with fixed stations in Russia.

HE 21 MC BAND

Interference can be still expected on the Mc band until the complete process of ıifting frequency under the Atlantic City ıble is completed somewhere about 1955.

As was announced the WIA took appropriate action with regard to Radio Pakisan operating on 7010 Kc/s, and a promise as been received from the authorities hat this station will change frequency. 'he next few years will show what to xpect in the way of an effective clearnce of other stations.

No alleviation of the interference on the 3.5 Mc band can be expected, but fortunately most offending stations are reasonably remote from Australia.

Signal strengths do not reach high levels, sufficient really only to interfere with DX operation.

In the mornings when looking for Europeans the band is a continuous series of commercial and service stations. Very seldom can an amateur station be heard "in the clear".

In Europe the interference must reach very objectionable levels but stations must appreciate under the band sharing arrangements that nothing can be done to reduce it.

IN AUSTRALIA

In Australia we are fortunately located away from the main centres of activity. In North America they experience severe intereference mainly from South American stations. In the former continent the 3.5 Mc band is exclusively amateur for a band width of 500 Kc/s, and the 7 Mc band is 300 Kc/s wide.

The problem of commercial interference will possibly not appear so acute when the higher frequency bands are again in constant use.

At these frequencies communication is restricted mainly to long distance working due to skip, and few nationals have territories to communicate with. For intra-country working the lower frequencies are in greater use.

The work of amateurs in reporting infringements into exclusive amateur allocations to national societies is important, and continued effort should assist in reaching the final goal, the clearing of offending commercial and service stations.

The only solution is for societies to repeatedly approach their respective national authority listing offending stations.

PHONE AND CW

SOME years ago the WIA suggested limits for CW and Telephony operation on the various HF bands, CW operation being used on the lower frequencies of each band, Telephony on the high end.

These limits were accepted as a "gentleman's agreement", no suggestion being made of compulsion or regulation. It was accepted generally and provided a valuable aid to operating.

It has been noted in recent months that these accepted limits have been forgotten, possibly due mainly to the fact that little publicity has been given to the agreement during the last few years. Telephony stations, generally newcomers, have been operating within 30 and 40 Kcs of the low end of these bands, sometimes much closer than that.

In view of the increased number of Telephony stations operating and of the loss of kilocycles on a number of HF bands due to international regulation changes, it would appear that the Institute could review the CW/Telephony gentleman's agreement.

There undoubtedly is a general lack of understanding on the matter and amateurs would prefer a clarification of the position.

Due publicity could be given to the result of any discussion and decisions.

EMERGENCY WORK

There appears still to be some doubt amongst amateurs, about the action they must take before they can operate in an emergency. The conditions have been set down by the PMG's Department and the information was published in the April 1952 issue of Amateur Radio.

It was as follows:—

Emergency Working:

Where amateurs are conducting emergency communications the following emergency signals will be used and adopted as standard in Australia.

For Telephony operation: The words "Emergency Traffic".

For CW operation: The letters QRRR.

Where life and property is endangered and no normal means of communication are available the following action can be taken.

Amateurs are permitted to conduct traffic using the above signals without prior consent of the Department.

This final clause leaves the responsibility of first handling traffic on the amateur in the affected area, who would best be in a position to decide the true state of the emergency.

OVERSEAS COMMENT

IN Great Britain amateurs have in recent months been receiving requests via amateur radio from European countries, for rare drugs for the treatment of persons said to be seriously ill.

The RSGB is concerned that these requests are being made. It points out that special international channels are available for doctors to obtain such drugs, and that amateurs may be running into trouble with the GPO by acting on such requests.

The Society also points out that the drugs may be really required, but also might find their way to the European black-market.

Amateurs are reminded too that under the terms of their licence and under the general provisions of the Wireless Telegraphy Act, they are precluded from devulging the contents or even the existence of a message to any unauthorised person and that this, of course, includes the Press.

These latter terms are also applicable in this country.

DX on the 80 metre band has disappeared for the winter and little has been

WIA NOTES

It would appear from reports presented o the NSW WIA class manager by the AOCP class manager Ken Kimberley, VK2AXZ, that it would be desirable to xtend the period over which the class ow operates.

An extension from 6 to 9 months was nentioned to ensure that all technical ubject matter is covered relevant to the resent AOCP examination.

It was felt that the technical standard f this examination had been increased n recent years although the length of he course has remained constant. Additional time is required to cover the greater field of the examination.

Newly appointed to the NSW WIA Divisional Council are Vince Bennett, VK2VA, and Charlie Quinn, VK2AWQ, both well known amateurs and experienced in amateur society administration.

Vince is an ex-member of the council and an active amateur for over 20 years, Charlie is ex VK3WQ, was a Federal Councillor and member of the Victorian Divisional Council.

NEW CERTIFICATE

The Victorian Division of the WIA have proposed that the Federal Executive issue a certificate for "all States working on the HF bands". Decisions on the proposal will be made by the various Divisions. Prefixes VK1 and VK9 were to be excluded from the requirements of the award in view of the reduced activity in these areas.

Plans for the 1954 South Western Zones (NSW) Convention were discussed at a meeting of amateurs held in June at Wagga. Preliminary arrangements were made for the event.

LOCAL DX

A local "DX Expedition" along similar lines to those overseas trips mentioned last month was the operation of Bruce Barnard, ZL1AJU, from Len King VK90K's transmitter during his holiday on Norfolk Island in April. Bruce spent much of his spare time operating and during his stay of two weeks contacted 458 stations, nearly 30 contacts a day.

Bruce's main object was to provide some DX for the newcomers to amateur radio in New Zealand who are restricted to operation only on the 80 metre band for their first 12 months. They do not receive a "High Frequency Permit" until they serve this probationary period.

Operating on the 20, 40 and 80 metre bands Bruce worked all continents, with his best DX as ZD9AB, Tristan da Cunha, and PX1YS, Andorra.

These stations cover rare prefixes, but Bruce was possibly just as rare to them.

He contacted many Australian and NZ amateurs on telephony on the 40 and 80 metre bands, their first Norfolk Island contact. QSO's with all W call areas and many Central Americans and PJ, YV, &c., were also recorded.

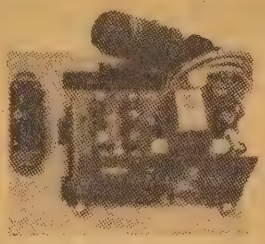
The transmitter used an 813 in the final, with a 100 watts modulated by PP 805's.

The receiver an AR88 and the Antenna a 132ft centre fed dipole. Bruce reported that the noise level at the location was higher than at the home QTH, and experienced some spot trouble from local commercial transmitters close by.

It was a new experience to be choice DX according to the operator, and an excellent way of spending the spare time during a holiday. He helped many stations to list a new country.

Special QSL cards have been printed.

NEW AMERICAN INDICATOR-UNIT



These Indicator Units contain the following Valves:— Six 6SN7GT, one 6G6, one 6H6, one 6X5GT, one 2X2 and 3BP1 C.R.O. tube which is fitted in a separate shield on a 4ft shielded lead and supplied with control box and plug; case and shield are finished in black brocade.

£10/17/6 F.O.R. IN ORIGINAL CARTON

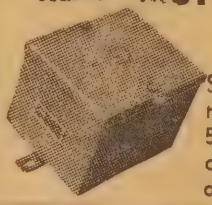
HIGH RESISTANCE HEAD PHONES (3000 Ohms)

THESE PHONES ARE USED BUT IN GOOD CONDITION SUPPLIED WITH HEADBAND AND CORD .. .. **22/6** per pair.

LOW TO HIGH IMPEDANCE HEADPHONE TRANSFORMER WITH PLUG 5/- plus postage.

Brown's English High-Resistance Headphones 2000 OHMS. Supplied with headband and cord (new in carton). Per pair **37/6**

NEW INSTRUMENT OR POWER SUPPLY CASE



Steel case finished in grey brocade measuring 8in long by 6in wide by 5½in high containing small chassis, condensers, resistors and 10,000 ohm. W.W. Pot. 17/6 plus postage.

NEW RELAY-TYPE-COUNTER

These Electronic Counters counting from 0 to 9.999 have a 250 ohm coil

26/6

Supplied in grey brocaded box complete with rectifier and transformer for 240V operation, £2/5/-

GRIMES ELECTRIC MOTORS

MADE IN U.S.A.
24 Volts D.C., 1.25 amps.

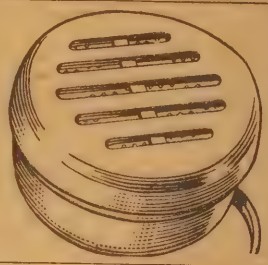
Reversing connections. 11 segments commutator. Size as illustrated, with gearbox 3 x 3¾ 2 inches. Supplied R.P.M., also automatic electric brake for quick stop-complete with r???action gearbox to approx. 100 ping. May be used without gearbox where required.

PRICE 42/6 each
Packing & postage, 2/- extra.

PILLO-FONE EXTENSION-UNIT

IT'S A REAL MINIATURE WITH ROLA UNIT

Install it anywhere, in the sick-room, workshop, garage or any room in the house. Just connect across voice coil of the existing speaker. The "PILLO-FONE" IS THE MOST CONVENIENT LITTLE UNIT YET DEVISED. 3½in Diameter by 1¾in deep. POST FREE **22/6**



ENGLISH I.F.F. MOTOR

English I.F.F. motor complete with gearbox 24V. D. C. operation but suitable for conversion to A.C.

Postage extra. **£2/10/-**

H.F. OSCILLATOR

Small H.F. oscillator suitable for conversion to the 144 mc. Band complete with split stator condenser, vernier dial and 957 acorn valve and socket.

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NEW UNIVERSAL--MULTIMETER

Manufactured by Robinson Electronic Laboratories

Incorporating 4½" world famous American Weston Meter

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D. C. Ranges	A. C. Ranges	D. C. Current Ranges	Resistance Ranges	Output Ranges	PRICE
0-12V	0-12V	0-1.5MA	0-5000 ohms	0-12V	£12/17/6
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0-300V	0-300V	0-60MA	0-500,000 ohms	0-300V	
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ALSO DECIBEL SCALE-18 to plus 5D.B.

METROPOLITAN RADIO SUPPLIES, 479 PARRAMATTA RD., LEICHHARDT

eard except VR3A, an odd European ppearing in the morning around day-reak, SM7BDR being the most consistent tation heard.

14Mc in June provided plenty of W's in ne afternoons with an occasional uropean around 1500 hours East, Africans ppearing about one hour later. Weak uropeans can be heard in the mornings.

Ultra-highs in N.S.W.

THE NSW Division's UHF section conducted a 144 Mc band "Points per mile" field day on May 16. Support throughout the State for the event was very good and a number of excellent long distance contacts were made with stations using portable equipment.

The competition was divided into two sections, one for stations in the field, the other for home stations. Scoring was similar for both types of stations, one point being recorded for each mile covered during a contact.

Certificates too were awarded to the stations making the contact over the greatest distance.

In the field out from Sydney were John Miller and party VK2ANF, at Razorback, Bob Winch VK20A the Jib, Mittagong, Ray Hancock VK2YM Mt. York, Blue Mountains, Cliff Lamb VK2LG Mt. Tomah Blue Mountains, and Horry Lapthorne VK2HL, Quinlan Fire Tower near Morrisset.

Out in Western NSW and operating from their home stations were three amateurs.

They were Hugo Stitt, VK2WH, of Forbes, Norm Skulander, VK2JW, and Don Kirby, VK2ALX, both of Orange. From Canberra Arch Cox, VK2GU, and Ron May, VK2PM, were active. From furthest north was Ken Mitchelhill VK2ANU, Muswellbrook, plus many Hunter Valley stations.

In the south both Ross Weeden VK2PN and Geoff Page VK2BQ of Tumut were in the field.

The longest distance covered was a contact between VK2ANF portable Razorback out from Camden some 40 miles south west of Sydney and VK2WH Forbes, the distance 154 miles.

The area covered by these 144 Mc field days is increasing on each occasion, and it would appear that in a few years practically the whole of the State will be covered by a net of portable stations on this frequency.

The lecturer at the June meeting of the NSW Division UHF sections was Ken Andrews, VK2ATK when he explained the workings of the slide rule, and showed some solutions to complex problems with the aid of a 42-inch rule.

The section conducted on June 6 a 144 and 50 Mc scramble from 8 to 9 pm. At the conclusion stations competing submitted their scores.

The results of the event were announced half an hour later by VK20A on 144 Mc, VK2AJR on 50 Mc assisted by President Perc Healy, VK2APQ. No need for a delay due for a wait for logs or published results under these circumstances.

Novice licences

The ARRL has since the inception of the Novice Class licence in the US given every assistance to this class of licence. Amongst other events they run annually a "Novice Round Up" which affords the WN's an opportunity of meeting one another in a nation-wide event. It is regretted that the WN frequency allocation on 7 Mcs runs only to 7200 Kcs and does not reach the edge of our 7Mc band.

WN stations with their maximum power of 75 watts are often heard at excellent strength and should be readily contacted. The only problem is, one cannot judge on which frequency to call them.

The necessary amendments to the Wireless Telegraphy Regulations have been enacted and limited AOCP licences are now available here in Australia, and shortly an influx of such stations should be noted on the UHF bands.

YOUR OPPORTUNITY

to join the world-wide ranks of amateur transmitters! The Wireless Institute of Australia holds regular classes in Sydney to assist Sydney and suburban enthusiasts to obtain their Amateur Operator Certificate of Proficiency.

Write for particulars to the Class Manager, W.I.A., Box 1734, G.P.O., Sydney.

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13 x 10 x 2½	14/-
17 x 8 x 3	17/6
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We specialise in either 16 or 18 gauge panels; listed are the most popular.

18G. .040 THICK

7 x 5 ..	2/3	12 x 8	4/6
9 x 7 ..	3/5	14½ x 8	6/-
11 x 8 ..	4/6	18½ x 12	11/4

BAKELITE PANELS

Black Finish

6 x 6 ..	6/-	9 x 8 ..	10/6
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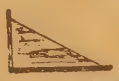

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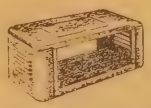

INSTRUMENT CASES

Lift-up Lid

15¼ x 7 x 8¼ deep. Suits chassis 11 x 8. Price 61/9.

Add postage.

METAL CASES

"A" 5 x 5 x 4 deep .. 15/9
"B" 7 x 6 x 4½ deep .. 17/3
"C" 9 x 7 x 5½ dep .. 18/9

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— NOTE —
Mail Orders ONLY
No counter sales.

ROLA SPEAKERS

3C	1-13-9
5B	1-9-4
5-7H	2-7-8
6H	2-6-0
6-9H	2-12-1
8H	2-6-11
12M	3-19-0

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"Q PLUS" COILS

Aerial, RF Usc.	12/11
I.F. Trans.	19/4
R.F. Chokes	6/-
Whistler	8/6

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Potentiometers, 150K and 250K, 3/- each.
10K, 2/6 each, 1K, 1½K, 2½K, 3K, 8/- each.
Two Gang Midget Condensers, 11/6 each.
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3W .. .. 2/3 ea.
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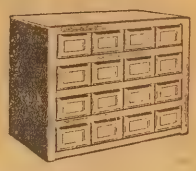

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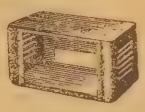
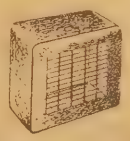
Postage: Vic. 2/9; Other States 5/-.



METAL CASE

(Louvred Sides)

Model 206. Ventilated type. Black wrinkled finish, loose front panel. Size 11 x 5½ x 7in high. Panel size 9 x 7. Suits chassis 8 x 5. Our Price 26/9. Add postage.



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Specially wound on neat wooden spools in popular lengths. All B&S sizes.

Gauge.	100	200	300ft.
16	9/6	17/-	25/-
18	6/3	12/-	17/-
20	4/-	7/6	10/-
22	2/9	5/-	7/6
24	2/6	3/4	4/9
26 and 28		3/4	4/9

Add postage.

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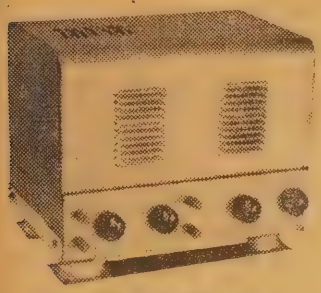

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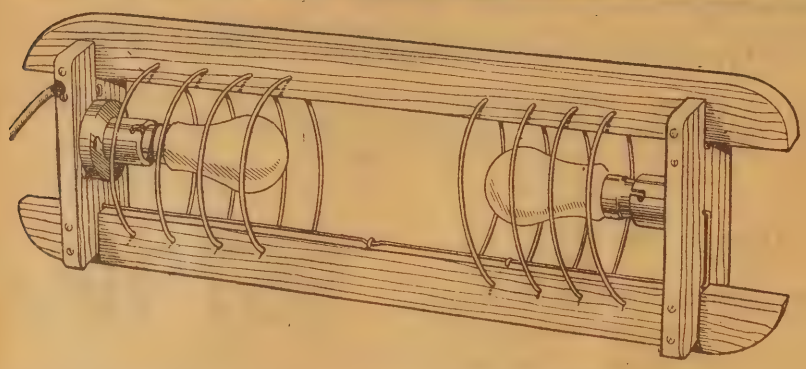


Fig. 1.—A perspective view of the completed appliance. The bent-over ends of the coils are not shown.

The old-fashioned bedwarmer had much to commend it, and as a means of warming the bed before retiring, it was vastly superior to the little hot-water bottles which replaced it. Today a safer and more reliable means of heating the bed is afforded by electricity; but of electric warmers placed on the market in the past, most suffered from the defect of heating only a limited portion of the bed.

A SIMPLE if primitive warmer on these lines may be made from a large, square biscuit tin with lid removed, and a pendant bulb-holder inserted in a hole in the bottom of the tin. With the tin on its side and using a 25-watt bulb, reasonably effective local results may be obtained.

At the other extreme, the writer has heard of a home-made device consisting of a ¼kw heating unit housed in a container in the bed and fed by a blower, which is said to provide the desired results in a matter of minutes. This, however, would seem an unnecessarily energetic attack on the problem, necessitating a special clause in the fire insurance.

The device described below, and shown in Fig. 1, which can be constructed in the matter of a few hours and uses very simple materials, has been found very effective and free from most of the failings of commercial appliances tried out. It will be found capable of inducing considerable and continuing warmth to practically the whole of a single bed.

CONSTRUCTION

The construction will be apparent from Fig. 2. The dimensions shown are those adopted for a number that have already been built, but, apart from the overall dimensions which have been found to be the most practicable in use and should if possible be adhered to, the measurements may be adapted to the materials at hand. The only exception is that the width of the struts should be at least 2½in, as shown, if they are to accommodate the bases of the normal batten lampholders employed.

The appliance generates considerable warmth in use, and for this reason timber without knots shou be selected if possible as the he causes the resin in the knots run. For the same reason the stru should be secured to the runne by the three-screw fixing show and should not be glued. If t notches in the struts are made tight fit on the runners there w be no movement in use.

All outer timber faces and arris should be well glass-papered, pa ticularly the outer edges and en of the runners which have to "ru between the upper and lower shee of the bed.

PROTECTIVE COILS

The protective coils for the lam are formed of 10-gauge galvanise fencing wire by wrapping firmly t hand around a cylindrical form of suitable diameter—an aluminiu saucepan was used by the writer- remembering that the coil wi spring out to a diameter about ½i greater when released. At least on more ring than seemingly neede should be wound to allow for thi and for end-lengths needed for fix ing.

Here is a hint for threading th coils into the runners. If attempte directly it will result in distortion After the timber frame has bee assembled it should be dismantled

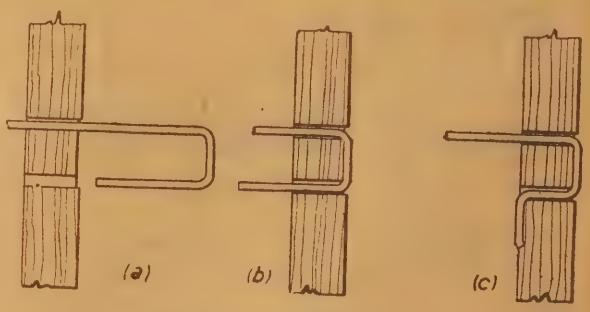


Fig. 3.—Method of fixing the ends of the coils.

and after the holes shown are drilled for the coils, the runners should be laid side by side with the holes in register. The ends of the coils may now be inserted into the first holes through both runners, when

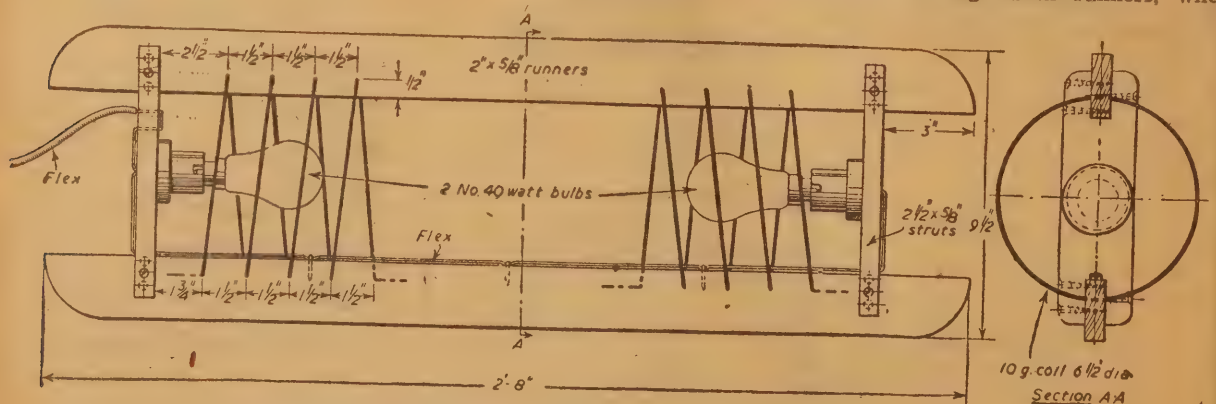


Fig. 2.—Side and sectional views, giving measurements and constructional details.

coils may be rotated and pro-ssively threaded until fully enter- the two runners being all the ıe kept close together. They y now be carefully separated und the coils and the whole frame ssembled. Holes 5-32in diameter l be found best for wire of the ve gauge; these will permit of y threading yet grip the wire suf-ently after the frame is reassem-d. A little thought, by the way, necessary in placing the runners correct register for threading. The ends of the coils can be most nveniently fixed as illustrated in . 3. The free ends are carefully ed through and straightened and as necessary, the remainder of operations (a, b and c) being th pliers and hammer.

IRING

Wiring is done with any suit-le 5 amp flex, the free end being the length required by the cir-mstances and being fitted with ıg or bayonet connector as re-ired. Great care should be taken make all connections properly d securely in the terminals of the mp-holders. The free flex (which anchored through twin counter-nk holes in the strut as shown) d the flex connecting in parallel e second lamp are junctioned in e terminals of the first lamp-lder.

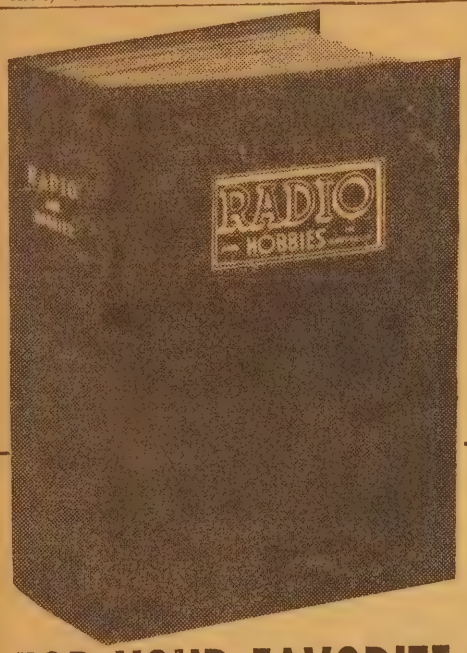
To render the flex to the second mp taut, disconnect the far strut and, by trial and error, make the connecting wire of such length that it will be taut when the strut is refixed. This flex is secured to the lower runner by two or three insulated staples.

If a three-way house circuit is available, brass batten lamp-holders may be used, and they and the protective coils may be earthed.

USING THE APPLIANCE

In use the appliance is inserted between the sheets, with the frame vertical, from the pillow end to about the middle of the bed, the opening at the pillow end being then closed. The upper bedclothes should be tightened to make as it were a tent over the warmer, permitting the whole width of a single bed to be warmed. After one hour's running the bed will be pleasantly warm; after two hours, assuming the normal bedclothes and eiderdown are used, it will be definitely hot, together with the underlying mattress, and will remain so for some time.

With two 40-watt lamps as indicated, the warmer may safely be left in operation all day if desired, although the reader would, no doubt, wish to verify this for himself! This makes a convenient and efficient way of airing the spare bed. It will not be found that there is any tendency to scorch the bed-linen by overheating.



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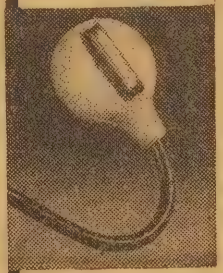

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A SIMPLE SET FOR BEGINNERS

(Continued from Page 35)

the reaction control as well as the tuning control.

If there is no sign of regeneration it is probable that the reaction winding is the wrong way round or there is not sufficient coupling.

If the reaction is too violent, and it is impossible to bring the set out of oscillation with the reaction capacitor fully out of mesh it will be necessary to reduce the coupling between the windings. This may be done by separating them as much as possible and, if this is insufficient, by reducing the number of turns on the reaction winding.

To house the set we suggest a simple wooden box made from plywood and the size of original front panel was calculated on the basis of 3-8in material for the base and two ends, and 3-16in for the back and top.

To accommodate the batteries we specified the inside dimensions of the box should be as follows: 8¼in long, 3 1-8in high, and 3¼in deep. The panel size to suit such a box should be 9in by 3 11-16in.

And, finally, a word about the headphones for sets of this type. For best results use a pair of high impedance type, ie, between 2000 and 4000 ohms.

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Y78a

A NEW MANTEL RECEIVER

(Continued from Page 61)

wise to wet the ply too much at t one time.

Bear in mind that certain me surements for the sides, bottom a front will include the thickness the material used.

After cutting out these parts the cabinet, they should be fitte together temporarily, using sma panel pins. Mark the individu pieces so that they can be r assembled in the same way.

Now dismantle the assembly, ru glue along the edges and reassembl driving the panel pins right hom When dry, sandpaper all edges an bevel the top of the side piece Glue the curved top in place, usin a couple of small screws into eac side piece in addition to panel pin This will obviate any chance of th top pulling out the panel pins an fracturing the glue before it is set.

CABINET BRACE

To prevent distortion of the cabi net before the glue dries, tack a horizontal brace across the rear fac and wedge a vertical brace betwee the top and bottom at the centr rear.

When fully dried out, sand down and give a good coat of priming paint. Two coats and two sandings is even better. When dry, sand lightly and lay on a good coat of the final color. We chose an attractive pastel green which gives an effect hard to pick from a baby moulded cabinet.

To back the grille, cut a piece of heavy cardboard to fit behind, making a cut-out for the speaker and control shafts. Cover the cardboard with loose-woven material of appropriate shade, sticking it down at the back of the cardboard with plastic tape. Secure the backing in position with glue or small drawing-pins. (Our choice was a scrap of beige crepe or shantung—or so our secretary described it!)

RUBBER FEET

Finally, fit four rubber feet to the underside of the cabinet to prevent scratching of the finish on the cabinet or other furniture.

The method of marking the cabinet around the tuning knob for station positioning may well vary widely according to the capabilities of the individual. One simple way is to cut a number of pins to about ¼in in length and drive them into the front panel at the appropriate spot on a suitable radius from the knob centre.

The chassis is secured in the cabinet with a 2in by 1-8in bolt passing through the cabinet bottom to mate with a hole in the chassis behind the 6BV7 valve socket. The control shafts will need to be cut to the appropriate length.

Two-thirds of the smoke which makes London fogs yellow is attributed to the chimneys of private flats and houses.

WIDE SCREEN LOOKS A WINNER

(Continued from Page 9)

Rapid movement across the screen,), can produce a "strobing" effect, nich is enough to blur figures, if t to produce an obvious jumpiness movement.

APS FOR UNWARY!

The simple truth seems to be that e more graphic the method of pre- ntation, the more easily can it ghlight the unreal and artificial. For example, the fate of King rthur rested, according to a recent m, on the encounter between two rmies". There were dramatic angle ots of knights charging across the mmon; of the stir in the opposing nks, and the counter charge. Unfortunately for one's peace of ind, the wide-angle lens just pre- ously had shown the two "armies") close together that there was ardly room for a charge to get arted!

And the archers! If the film's pro- ortions weren't at fault, then they ere a pretty poor lot. Arthur should ave been thoroughly ashamed of iem!

With the wide screen has come the ontention that you must have "wide)und" as well — the sound seeming) come from the position on the :reen where it ostensibly originates.

Wide or "stereophonic" sound isn't new idea by any means, one of the arliest demonstrations of it being rranged in Sydney by local film in- erests.

Disney exploited it to the full in is Fantasia, the sound for this pic- ure being recorded in several chan- els on a separate film. As a con- ession to compatibility, however, he film also carried a single compo- ite soundtrack for use with conven- ional projectors.

Fantasia was very well received,)ut, in point of fact, most patrons ieard only the contents of the com-)osite compatible track. The sound ilm and the equipment to play it generally stayed behind.

MAGNETIC TRACKS

More recently, the stereophonic)rinciple was employed in The Robe, he film carrying special magnetic racks rather than optical. The film vas therefore, not immediately com-)atible, although its promoters de- veloped a special adaptor which :ould be installed above the light gate on a conventional projector.

There has been much talk about nagnetic tracks becoming standard n the future but the issue is by no neans certain.

What has happened, however, is hat MGM are pushing their own 'fully compatible", optically re- :orded, stereophonic sound system. Films carrying it can be made to produce stereophonic sound or not, according to the equipment avail- able and the wishes of the exhibi- tor.

PERSPECTA

The track looks like a perfectly conventional optical track, except that, in addition to the normal sound impulses, it carries control signals at 30, 35 and 40 cps.

These are in the extreme bass register and, being approximately 16 db below reference level, are not normally audible when the track is reproduced by a conventional sound system.

To obtain the benefits of the so-called "Perspecta" sound, however, the signal from the projectors is routed through an amplifier panel containing filters tuned to 30, 35 and 40 cps respectively. The output from these filter circuits control the gain of three separate preamplifier channels.

If only a 30-cycle sub-tone is present on the track, the sound is diverted through the particular preamplifier channel. The substitution of another sub-tone will divert the output to one of the other preamplifiers. Alternatively, the program may be passed simultaneously at appropriate volume through two or all three channels, if so required.

By its nature the system allows a degree of contrast control to be achieved, thereby increasing the effective dynamic range.

The output from the preamplifiers is ultimately fed through three main amplifiers to speakers appropriately placed behind the screen.

In theory at least, the voice of a character strolling across the screen will be heard to come first from say, the right-hand speaker, then gradually fade from this to the centre speaker, finally transferring to the left-hand unit.

The system undoubtedly "works", but compatibility has been achieved only at a price. The control circuits, probably of necessity, have a noticeable time delay and, when they do function, their action is often more like that of a switch.

An actor's voice thus often tends to jump from place to place, the effect being highlighted by slight differences in the individual amplifiers and the coverage of speaker systems. Bad examples of this destroy rather than create atmosphere, because they draw attention to the source of sound and emphasise its artificiality.

Dispersed sound, as from an orchestra, cannot be presented at all in true stereoscopic form, because the system cannot produce different sounds simultaneously from different speakers.

MOVING SCENES

For the most part, all speakers must operate in parallel, though it may predominate in one speaker or another, if one section of the orchestra is dominant at a particular instant. Drum beats can appear to come from one position or another only because they temporarily "capture" a channel and divert all the output momentarily through it.

Which raises an interesting point: When the camera suddenly swings from a front to rear view of the orchestra, should the sound channels change over also or maintain their conventional output relative to the audience?

It does seem that the use of wide screen and "wide sound" must lead to less frequent changes in camera angle. If not, viewpoint and sound will for ever be chasing each other, like horses on a merry-go-round.

Bound up with the whole question of new sound is that of improved fidelity — one that the film industry has been able to sidestep thus far.

There was a time when "film quality" was good quality to most people, because it was better than anything they heard in their homes.

However, to ears growing accustomed to modern records, it is becoming painfully obvious when a mass of fiddles on the screen succeed in making only a very dull sound. Very slowly (but surely), the public's conception of quality is becoming better informed.

NEEDS NEW GEAR

Magnetic tracks could provide the answer to this also, but exhibitors aren't queuing up to get them. They're not directly compatible! They need new sound heads, perhaps a new amplifier and these things cost a lot of money in the movie industry.

Right now, as we said earlier, the movie industry has to think up new ideas which will keep it ahead of television in its spectacle and public appeal. If at all possible, these new ideas and approaches must be mated with the current film and projection standards.

But the going is getting tougher all the time. Sooner or later, the industry, as a whole, may have to sink its differences and decide on a new world standard which will cater for 3D, wide screen, stereophonic sound, high fidelity and anything else it has under the wraps.

The word "compatibility" can't last for ever.

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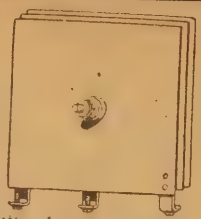
BRAND NEW ENGLISH RECTIFIERS

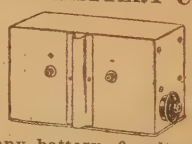


Make yourself a Battery Charger.
12v. 2 amp, 32/6
6v. 5 amp, 50/-
12v 5 amp, 79/6
12v. 3 amp, 45/-
6v. 2 amp, 24/6
6v. 4 amp, 45/-

Transformers to suit above Rectifiers, 2 amp, 37/6; 6 volt. 5 amp, 45/-; 12 volt, 5 amp, 55/-.

COMPLETE BATTERY CHARGER

Fitted with Brand New English Selenium Rectifier.



Works off 230v. Household supply.

Charges any battery, 6 volts at 4 amps. £6/15/- complete. Also available, 6 or 12 volt Chargers combined. Charge 2 amps, £7/15/-. Brand new 6 volt, 2 amp Chargers, complete, £5/2/6.

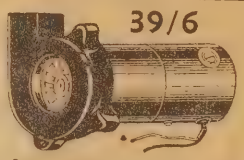
Replace those broken side curtains with cellulose acetate which takes the place of celluloid and lasts four times longer. Will not discolor.

32/6 SHEET.

Non-inflammable actetate sheet is recommended for all types of side curtain. Sheets are 20 thousandths of 1 inch thick. Size of sheet, 24in x 52in. Can be sewn or cemented into frames.

English Motor and Blower, 24 volts.

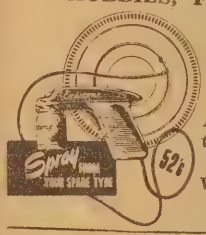
Will work off any Lighting Plant.



39/6

Larger size also available that will work off 12 or 24 volts £3/15/-.

SPRAY YOUR CAR, TOYS, HOBBIES, FURNITURE



52/6

Spray from your Spare Tyre

An Ideal Tool for touching up damaged paintwork. Will spray Lacquer, Paint, Enamel.

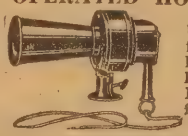
ARMY SPOTTING TELESCOPES

Many uses on the farm. Ideal for Sheep Spotting.

Useful on the rifle range. 3 draw 17in long 6¼in closed 1in object lens 18 magnification, made in England. **£7/19/6**

GENUINE AMERICAN KLAXON HAND OPERATED HORNS

Very Loud. Ideal for Factories, Trucks, Boats, etc.

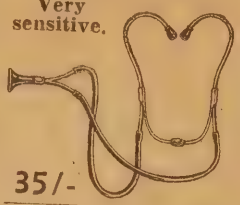


Useful for Time keepers. Brand New. £4/4/-.

MECHANICS' STETHOSCOPES.

Ideal for Testing Engines, etc.

Very sensitive.



35/-

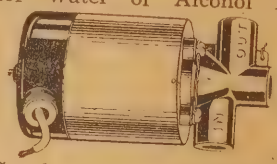
GENUINE WATERPROOF AMERICAN STYLE SAFARI JACKETS.

FULL FRONT ZIPP FASTENER

IDEAL FOR MILKING OR ON THE MOTOR BIKE

LIQUID SHUT OFF VALVES

Will work off 12 or 24 Volt, ideal for Water or Alcohol Injectors.



50/-

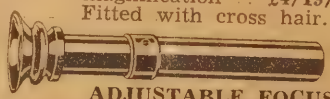
Can be used as Petrol shut off for car protection. Many factory uses.

ARMY FOCUSING TELESCOPE

Easily converted for use on dumpy levels.

Can be used as a rifle sight. Excellent magnification . . £4/19/6.

Fitted with cross hair.



ADJUSTABLE FOCUS

AMERICAN VACUUM or AIR PUMP

Builds up air pressure to 20lb at 1000 R.P.M. develops up to 120lb of hydraulic pressure; will pump 7½ gallons S.A.E. oil or other liquids per minute. Useful for spraying, milking, presses, oil burners, hydraulic systems £3/10/-

BRAND NEW LEVER TYPE GREASE GUNS WORTH £4/19/6

59/6

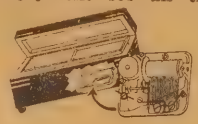
Ideal for all types of Trucks, Tractors or Cars. 7500lb pressure.

ENGLISH ARMY SPOTLIGHTS

IDEAL FOR SHOOTING. FIT ONE TO YOUR CAR.

6-volt 37/6 12-volt 25/-
Fitted with Mirror Reflector.

Now you can make your own music box with these Swiss music units. They can be fitted to any type of box doll, jug, teddy bears, etc. Hours of enjoyment for all the family.



30/- EACH

Tunes available: Lili Marlene, Jingle Bells, Blue Danube, Harry Lyme Theme, Wedding March, The Merry Widow, Happy Birthday, Annie Laurie, How Dry We Are, Roll Out The Barrel.

R.A.F. LEATHER FLYING HELMETS

35/- each

Intercommunication Tubes 50/- set.

Polaroid Goggles 48/6.

MK8 Goggles 48/6 PR.
MK7 Goggles 37/6.

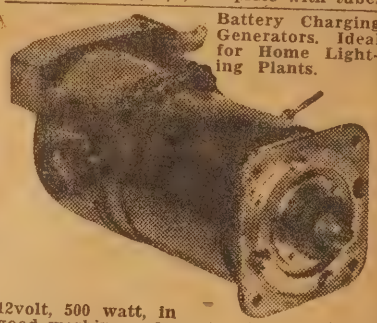
WOOL LINED FLYING BOOTS £5/15/- pr.

Brand new AEROPLANE WHEELS

IDEAL FOR WHEELBARROWS, HAND-TRUCKS, TRAILERS, Etc.

10½in x 4½in £4/15/-, complete with tube.

Battery Charging Generators. Ideal for Home Lighting Plants.



12volt, 500 watt, in good working order £5
12-volt, 500-watt, new £7/10/-
24-volt, 1000-watt. Brand new, £12/10/-
200 amp Generator. Ideal for welding. Made in America. Brand new £50
Tested and in perfect order . . £35

WATCHMAKERS AND INSTRUMENT MAKERS

5 SIZES

English Tweezers . . . . . 6/6 and 5/6
Eyeglasses . . . . . 6/6 and 8/6
Extra strong double lens Eyeglasses, 15/-
SCREWDRIVERS, set of 5 13/9

STOP PRESS Army Paint. STOP PRESS Just arrived.

Blue or Grey, Oil base . . . . . **25/- gal.**

STORES

: Elizabeth St., Melbourne, C.1.
n Victoria Street. 'Phone FJ5904
d Efficiently Despatched
Include State in Address

Stock and Die Sets, ¼in., ⅜in. and 1in. water pipe, £4/19/6.

IN FIRST CLASS ORDER DALTON COMPUTERS IDEAL FOR AERO CLUB. 45/-.

Aircraft Bomb Hoists ideal for garage work, £6/15/-

At last! The spotlight you have been waiting for.

53/6

omplete with
x and switch.

Fitted with genuine American sealed beam 6-volt globes. No motorist or boat owner should be without one.

Ideal for Fox or Rabbit Shooting.

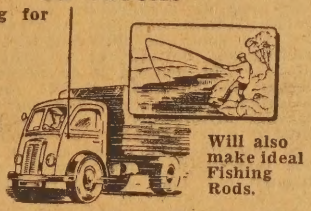
SPECIAL DISPOSALS METER OFFER.

0-10 amp meters, AC-DC 2½in dial, 45/-
0-1 milliamp, 2½in dial ... 37/6
Weston 0-50 volt 0-100 amps combined M/coil, £3/10/-
glish 50-0-50 Ammeters, M/Coil 37/6
g. 0-50 Ammeters, AC-DC 42/-
glish 0-20 Voltmeters, M/Coil .. 25/-
glish 0-40 Voltmeters, M/Coil 25/-
glish 0-300 AC-DC Voltmeters .. 55/-
glish 0-5 Milliammeters, 2½in 27/6
glish 0-25 Ammeters, 2½in M/c 30/-
glish 0-10 Ammeters, 2½in dial, Moving Coil 45/-
glish 0-30 Voltmeters, 2½in dial, AC-DC 42/-
g. 0-40 Ammeters, 2½in dial AC-DC 42/-
ig. 0-50 Ammeters, AC-DC 42/-
ig. 0-3 Ammeters, 2½ dial, AC-DC 45/-
ig. 0-150 Voltmeter, 3in Dial, Moving Coil 39/6
ig. 0-500 Micro Ammeter M/Coil 37/6
ig. 0-150 Ammeter, 3½in Dial, AC-DC 75/-
ig. 0-20 amps, 2in Dial, M/c 25/-
ig. 0-1½ Milliamps, 2in Dial, M/c 19/6
ig. 0-20 Milliamps, 2¾ Dial, AC-DC 17/6
ig. Multimeter, reads ohms and volts 35/-

STEEL ARMY TANK AERIAL RODS, WILL MAKE IDEAL RADIO AERIALS FOR CAR OR TRUCKS

Too long for postage. Advise nearest railway Station.

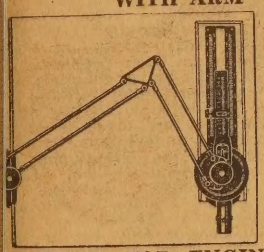
Base to suit Aerial, 9/6 each.



Will also make ideal Fishing Rods.

12ft long, 3 sections. Each section 4ft, 22/6. 8ft long, 2 sections, 15/-.

R.A.F. PLOTTING BOARD WITH ARM



Bakelite Base. Draws Angles Parallel or Vertical.

70/-

IDEAL FOR ENGINEERS, STUDENTS, ETC.

45/- COMPLETE

Professional Magnifier with Stand and Extension Arm, Useful Doctors, Painters, Mechanics, Engineers, Photographers.

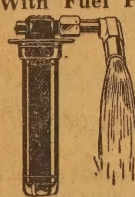
GENUINE AMERICAN FLYING HELMETS

IDEAL FOR MOTOR CYCLISTS AND ALL OUTDOOR WORKERS.

BRAND NEW, 15/- EACH.

24-VOLT MOTOR COMPLETE With Fuel Pump

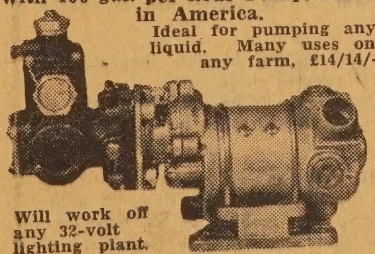
deal for Caravans. Takes the place of Hand Pumps. 5 each.



Many uses on the Farm. Will transfer Petrol or any Liquid from Drums, etc. Will work from 24 or 32 volts. AC or DC.

Aircraft 24 volt Motor complete with 400 gal. per hour Pump. Made in America.

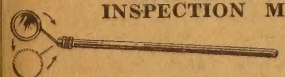
Ideal for pumping any liquid. Many uses on any farm, £14/14/-



Will work off any 32-volt lighting plant.

Pump only, 55/-.

BALL AND SOCKET INSPECTION MIRRORS



8/9 each

Ideal for mechanics, radio repairs.

ARMY FLUTES

39/6

Ideal for School Bands. Never before at this amazing price.

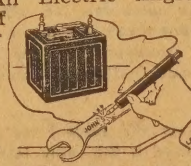
SPECIAL OFFERS

American Schrader tyre pumps, work from your spark plugs, 39/6. Fish pond aerators, work from 230 volts, 57/6. Commando Telescopes, ground lens, 45/-. Sampson low pressure Spray Guns £6/17/6. Aircraft Pressure Gauges, 0 to 20lb pressure, 22/6. 0-200lb, 25/-. Pressure type Oil Cans, 15/6. Aircraft Rev Counters, extra long lead, ideal for boats or cars. 75/-. Steel Mechanics' Tool Boxes, lift out tray, 32/6. Pocket Magnifying Glasses, 8 mags, 8/6; 10 magnifications, 12/6. Metal Drill sets, 1-16 to 3-16, 9 Drills for 3/6. 24 volt motor and hydraulic pump, capacity 3½ gals. per minute, £3/15/-. Automatic actuators with 24-volt motor geared with telescopic shaft 400 r.p.m., can be used as fence post borer, etc., 55/-. Hydraulic pumps, 1200 p.s.i., 8 1-3 gal. per min.; £18/18/-; 5 gal. per min., £7/10/-. Generator Test Meters, 35-0-35 amp meters, 4½in dial, 45/-; 0-10 volt meters, 4½in dial, 45/-. Loading Resistors can be supplied to make meter read 10.20 at 12/6. Medical Scalpels, many uses, photographers, etc., 6/6. Shaded Pole Induction Motors made by Hoover of England, 230 volts, AC. Ideal for Projectors, Tape Recorders, Fans, etc., £4/19/6. SAE open end Spanners, 6 to set, 24/6. Whitworth, 4 to set, 18/6. 2½in Paint Brushes, set in rubber, special price, 10/6. Brand new 7-8in Spark Plugs, suit most old type cars, 2/6 ea. Tapped Transformers, 6 12, 18 and 24 volts, 3 amps, 39/6, 230 volts input. Low pressure Spray Guns, 39/6. Army Steel Tow Ropes with looped ends, 17/6. Army Tripod for photographic work, levels, etc., 41in long, 22/6. Whitworth Spanner Sets. Open one end, ring the other, 25/-. 6 spanners to set. 230 volts AC Neon Testers, 4/6. New headphones suitable for crystal sets, 17/6 pair. Genuine Lucas 12 volt Horns worth £3/15/-. Our price 39/6 new. Genuine Stanley Lino Cutting or Hobby Knife with 5 blades, 9/9 Grand new Army mosquito nets. Ideal camping 35/-. Genuine RAAF Berets 10/6. Surveyors Abney Levels. New Price £18/18/-. £7/10/- Magnifying Glasses 8/6.

ELECTRIC ENGRAVER

What everybody has been waiting for. An Electric Engraver that works off your car battery.

Engraves anything in metal.



Ideal for name tags, dog collars, plant labels, etc.

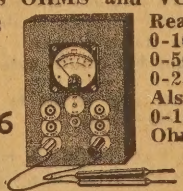
29/6

Engrave your name on all your tools. Marked tools are never stolen. No Garage should be without one.

AIR MIN. MULTI TESTER TESTS OHMS and VOLTS

COMPLETE WITH TEST PRODS.

£5/17/6



Reads 0-10 Volts, 0-50 Volts, 0-250 Volts. Also 0-10,000 Ohms.

ANSWERS TO CORRESPONDENTS

G.A.M. (Wooloowin, Q) writes to thank us for some information which we were recently able to supply and reports that our suggestion proved correct.

A.: Many thanks for your letter, G.A.M., and we were glad to hear that our suggestion had been helpful. Your experience with the mica capacitor is also interesting and we suggest that if you wanted to retain the excellent electrical characteristics of the mica type you could probably solve the problem by shielding it. We are also pleased to hear that you have had such success with the filter for the GP20 and we agree that the difference is quite marked.

B.F. (Geraldton, WA) would like to see some information on screen modulated amateur transmitters published in Radio and Hobbies. He is also interested in receivers designed for good performance on Morse signals.

A. We can't make any promises about either suggestion, B.F. There are so many other projects of interest to a large number of readers awaiting attention that your interests may be left behind. Basically, screen modulation is a form of efficiency modulation. The efficiency of the stage must be such that the amplitude of the carrier with no modulation is half the maximum amplitude possible under the particular conditions. To make it do this in a linear fashion with respect to screen voltage is not always easy, although some departure from linearity can be tolerated before the distortion becomes objectionable. Your present system appears to work satisfactorily so we suggest that you leave it in its present form. The double conversion receiver which was described in the January, 1951, issue of Radio and Hobbies would make an excellent "CW only" receiver. For extreme selectivity you could use a low frequency such as 175 Kc for the second IF channel.

B.E. (Wakurna, SA) is following the Teach Yourself Radio series and has struck trouble with the regenerative circuit. He wants to know whether there is any possibility that the circuit contained a mistake.

A. No. B.E., we can find nothing wrong with this circuit and we think it more likely that you have a faulty component of some kind. A reversed regeneration winding would reduce the efficiency of the set but would not prevent it from working; but failure of almost any component could cause complete failure. It is difficult to advise you from the brief details you have been able to supply and we can only suggest you enlist the aid of someone with a little more experience. In any case the circuit is perfectly standard and capable of excellent results when working correctly. We suggest you stick at it until the fault is found.

P.W.H. (Kornbil, WA) wants to know if it is possible to operate a 1.4 volt battery set from a commercial vibrator supply or, alternatively, whether we have ever described a power supply for this purpose.

A. Without exact circuit details of your set and the vibrator unit it would be impossible for us to say whether they could be used together. In general, however, this would not be so unless the two units were specifically designed to operate together. The Multi-Talkie described in the July and August, 1948, issues was a portable designed to operate from internal batteries, an AC supply, or a vibrator supply. This was only possible because the set had been designed with this end in view and is not the same as indiscriminately connecting any battery set to any vibrator supply. In general it is necessary to design the filament circuit for series operation rather than the more usual parallel arrangement, as is used when battery only operation is contemplated. The circuits and other details of the sets mentioned above may be obtained through our mail service for the usual 2/- fee.

A.C.R. (St. Peters, SA) writes to advise us of a change of address and to comment on the articles in the Radio and Hobbies which he finds interesting.

A. Your change of address has been duly noted, A.C.R., and all further issues will be posted to it. We are glad to hear that you like the publication and of the articles which interest you most. The form of power supply for the G-M counter has been used in CRO systems, it being most beneficial above about 2500 volts. It is likely that transistors, when available, will cost in the region of three or four pounds, though improvement in manufacturing techniques and greater production should eventually reduce this figure.

THE "RADIO & HOBBIES" QUERY SERVICE

ALL queries concerning "R & H," designs, to which a POSTAL REPLY is required must be accompanied by a postal note or stamps to the value of TWO SHILLINGS.

For the same fee, we will give advice by mail on radio matters, provided the information can be drawn from general knowledge. UNDER NO CIRCUMSTANCES, however, can we undertake to answer problems involving special research, modification to commercial equipment or the preparation of special circuits.

Whatever the subject matter, we must work on the principle that a letter is too involved if the reply takes more than 10 minutes of our time.

Queries not accompanied by the necessary fee will be answered FREE in the columns of the magazine and presented in such a way as to be of interest to others readers.

To those requiring only circuit reprints, &c., we will supply for TWO SHILLINGS diagrams and parts lists from our files covering up to three "R & H" constructional projects. Scale blueprints showing the position of all holes and cutouts in standard chassis will now be 4/6. These are available for nearly all our designs but please note they do NOT show wiring details.

Address your letters to The Technical Editor, "RADIO and HOBBIES," Box 2728C, GPO, Sydney.

Note that "RADIO & HOBBIES" does not deal in radio components. Price quotations and details of merchandise must be obtained direct from our advertisers.

K.N. (Greenwich, NSW) is building one-valve receiver described in November, 1952, issue of Radio Hobbies but is puzzled by the absenc coil data.

A. The coil for this set is the s as that used for the crystal sets in two previous issues and the dat given on page 73 of the September, issue. Briefly the details are as foll 65 turns of 24 gauge enamelled tapped at every 10 turns. Low pedance phones can be used with receiver but better results are usu obtained with high impedance ty Thanks for your comments about magazine and we trust that it will tinue to prove interesting and instruc

M.F. (Blacktown, NSW) is intere in the Teach Yourself Radio series wants to know whether the set descri in the November, 1952, issue would o ate a 2½in permag speaker.

A. If you have such a speaker av able by all means try it, M.F., but wouldn't hold out much hope of succ If you must try a speaker it would better to use the largest you can obt a 12in type being many times m efficient than a 3in type. In any the performance of this receiver, wh better than that of a crystal set, is the best which can be obtained from one valve set. The unit described the following issue obtains a very m better performance by means of regene tion.

M.D.B. (Adelaide, SA) has built All Wave Battery Two described in March, 1954, issue and is worried beca he has had to reduce the number turns on the reaction coil.

A. The fact that you have had modify the reaction coil as you descr is not really unusual, the exact amou of coupling, &c., depending on a lar number of factors. The important thi is merely to produce a smooth reacti control which will slip in and out oscillation without plops or clicks, in and out at the same point, and pe form consistently over the entire ban The number of turns required to achie this is of no significance.

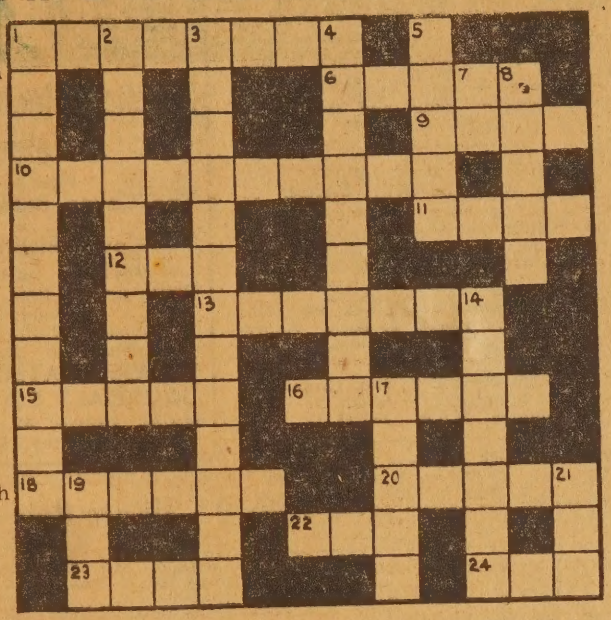
H.V.R. (Burleigh Heads, Q.) appea for help to combat the reception dif culties in his locality. He asks if a s has been designed specially for co ditions of the kind he describes.

A. We can appreciate your proble H.V.R., and suggest that the Multi-Ban Seven (August, 1953) would be abo the best solution to your problem. covers several short-wave channels ar is fitted with a noise limiter circuit. Th power output requirements are not qui as you would like but there is amp for record playing under domestic co ditions. Copies of the circuit may b obtained through postal service. How ever, it must be realised that there a limit to what can be done to eliminat noise by the design of the receiver. Nois limiters are successful only in the cas of high intensity, short duration pulse and are of no use where the pulses ar overlapping. The selectivity of the se plays an important part, the greater th selectivity the lower the noise level. I this respect your approach to the prob lem with a TRF receiver is liable t produce worse rather than bette results.

W.T.P.N. (Whyalla, SA) wants to know if we can supply details of an ignitio coil tester for 6 and 12 volts and als a capacitor tester.

A. We have never described an ignitio coil tester and we are afraid we ar unable to help you in this matter sinc we cannot undertake to design specia circuits for individual readers. We have described a simple capacitance meter i the April, 1946, issue and a resistance capacitance bridge in the December, 1948 issue. ircuits of both are available through our postal service. Either o these should be capable of testing the capacitors but the bridge device would probably be more elaborate than you require.

THE R. & H. CROSSWORD No. 5



ACROSS

. Grid return resistor
. Pertaining to ions
). Inert gas
). Twin-circuit
1. Type of radiation
2. Used in solder
3. Electrical design
5. Copper coins
6. Distant
8. Television trace
0. Used on work bench
2. Charge
3. Indicator
4. An age

DOWN

1. Prevents oscillation (2 words)
2. Magnetic coupling
3. Type of battery
4. 1000 cycles
5. An addition
7. That is (abbrev.)
8. Resin used in varnishes
14. Four-electrode valve
17. Electrical instrument
19. Electrical discharge
21. Source of cosmic rays

Solution and further crossword next month.

FROM THE SERVICEMAN WHO TELLS

(Continued from Page 41)

is no protection of any kind across e front of the cone.

The tragedy occurred when a group visitors descended on the fam- mansion, bringing with them a nall child with a very inquisitive ature. While the adults were dis- ssing the weather, the interna- onal situation, and other pleasan- ies, Oscar scuttled off on a tour exploration, finishing up in front the speaker baffle.

His father spied him at the last oment, finger poised in front of ie high frequency cone, and de- ended upon him with a threat at made everyone's blood run cold. ut it was too late; the exploring nger had probed, and having prob- d moved on, to leave behind a deep and irregular valley where once had been a smooth rounded hill.

Inspiration was brought on by the sight of a reel of adhesive cellulose tape. Surely this was the answer to the problem. I peeled off several inches and proceeded to press it, sticky side first, into the dent. At first it refused to "take", due to the shiny varnished surface of the cone, plus my own diffidence in applying pressure, but some careful pressing and smoothing finally produced results.

Then I took hold of the two free ends of the tape, pulled gently, and "pop"—the cone reverted to its original shape without so much as a blemish.

Last month's solution

M	I	C	R	O	F	A	R	A	D					
A		O		V		R			Y					T
G	E	I	G	E	R	C	O	U	N	T	E	R		
N		L		R			S		A			A		
E				H			C	A	T	I	O	N		
T	U	N	G	A	R		I		R			S		
I		E		U			L		O			C		
C		O		L	E	C	L	A	N	C	H	E		
F	A	N	S				A			R		I		
I		T		V	O	L	T	A	G	E		V		
E		U			V		I			W		E		
L	A	B	O	R	A	T	O	R	Y			R		
D		E			L		N			S	O	S		

MORE RADIO PARTS

A READER from Bentleigh, Vic., has some radio parts no longer needed which he will be pleased to present to three young readers of Radio and Hobbies who should preferably not be in receipt of a regular income.

Write airmail to: Mr. S. Johnstone, 43 Moylan St., Bentleigh, Vic.

Printed and published by Associated Newspapers Ltd., at the registered office of the company, 60-70 Elizabeth Street, Sydney, NSW.

A FORTUNE IN SEAWEED

(Continued from Page 17)

of very fine yarn is twisted with a thread of seaweed rayon, it can then be easily woven. During the subsequent scouring process, the seaweed yarn dissolves out leaving the fine wool fabric securely woven. In this manner fabrics weighing as little as 1½ ounces per square yard have been produced.

Much more could be said about this very wonderful use of alginic acid and its salts, but enough has been written to indicate its vast commercial potentialities.

Two more important seaweeds must not be overlooked, however, namely those of carrageen and agar.

Carrageen, as everyone should know who listens to the radio, is a seaweed found on the coast of Ireland—and elsewhere, such as the coast of Massachusetts! Large quantities are also found in Canada. The main commercial use of carrageen is in the production of gels.

FOODSTUFFS

These are used for making viscous liquids and jellies, which are in turn used for stabilising emulsions, making hand creams, shoe polishes, leather dressings, sizes for cloth, thickening for colors in print- and a host of other uses where gels are required. It is also used in a certain kind of cough mixture but, as I don't get paid extra for advertising, I won't mention it.

Agar is a well sought after substance obtained from a seaweed. It was made mainly in Japan and other Eastern countries before the war. The war cut off supplies from those countries and a world-wide search found it elsewhere including Western Australia.

The substance is a shredded looking weed which, on boiling, completely dissolves and on cooling sets in a firm but brittle jelly.

One of the most important uses is in the field of bacteriology. When mixed with nutrient substances it forms an admirable foundation for the growth of bacteria. Its other uses, however, include a glycerine substitute, an ointment base, making moulds for artificial limbs, artificial sausage skins, canned meats and fish, jelly in meat pies, thickening in soups, a laxative medicine, clearing agent for wine and beer, sizing medium for paper and textiles, mixed with graphite as a lubricant, and in the manufacture of electric lamp filaments.

It is used as a constituent in high-grade adhesives for plywood, and the manufacture of shatterproof glass. Photographic films are made from it.

Altogether it should be now evident that the much despised seaweed is a very important plant, and no doubt readers will now treat it with more respect, blue bottles notwithstanding.

Sovereigns used to contain only two parts of gold to one thousand parts of copper and other alloys.

★ ★ ★

A drug known as rutin, used to treat high blood pressure, is being produced from the buckwheat plant. It can be harvested three times a year.

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Pocket Book — STORYTELLER WEEKLY HAS THE PICK OF THE WORLD'S BEST STORIES

WANTED TO BUY, SELL OR EXCHANGE

Cost of Classified advertisements in this section is 2/- per line, approximately five words to a line. Closing date for August issue of Radio and Hobbies is Wednesday, July 14.

FOR SALE: Playmaster Amplifier No. 2. P.P. 6V6. As new. UA3094.

FOR SALE: Palec speedflash in new condition. 50 joules, dry battery type £25. C. Lancini, Mossman, Q.

FOR SALE: Aluminium sheets 9ft x 3ft, .086in heavy gauge. £4 each. Apply 167 Storey St., Maroubra, Sydney.

SALE: Aegis Kc 4 Coil Unit, Communications Type. New, unused. £15. Box 24, Turramurra, N.S.W. JJ3225.

SALE: All back numbers of R. and H. available at 4/- per copy, incl. postage. Write T. Weir, 73 Gibson Ave., Padstow, N.S.W. For prompt service. Stamps not accepted.

SELL: Vented Speaker enclosure. Solid mahogany, 5/8in ply front and back cloth-covered front. 12in Rola, long flex. Almost new £30. FU2121.

SELL: Curtiss feathering motor (beam rotator) £7. Exchange tape deck and R. & H. No. 2 Amplifier for oscilloscope. J. F. Harris, Amor St., Mt. Gambier.

SELL: 5 valve "Karset" radio, nearly new. Tone and range excellent. £22/10/-. J. Hunter, 31 Miller St., Mayfield West, Newcastle.

SELL: R. and H., January, 1947, to September, 1951, complete, also individual copies since to latest. Offer. Clarke, "Glendale", Wakool, N.S.W.

SELL: BC348AC 5" C.R.O. AWA Mobile Xmitter, complete set of power and mod. Tfms and valves for high power xmitter. Chapman, 239 Glebe Rd., Glebe. MW1292.

SELL: 301A Receivers £5/10/- each. A.R.B. Receivers £19/10/-. Meters, Valves, Transmitters, etc. at bargain prices. Suburban Radios. 334 Charles St., North Perth.

SELL: Printing. Special Offer:—100 Business or Visit Cards, 30/-; 100 Letterheads, 30/-; 200, £2. Sent anywhere by mail. Do it now! W. Hiley, 841 George St., Sydney.

SELL: 175 mA. tranny 3-125 Ma chokes, 2-gang condenser, 10in Rola electro spkr., BSR 3-speed gramo motor, valves 5U4G, 5V4G, 5Y3G, 6C5, 6SJ7, ECH35, 6J8GA, 6N8, 6B8G, 2—6SK7's, 3—6SN7's, 3—807's 3—1P5GT's, 1A7GT, 1Q5GT, 1H5GT, £25 the lot. L. E. Healy, 20 Cumming St., Toowoomba, Qld.

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